9-2350-257-34-2-3

TM 9-2350-257-34-2-3

CHAPTERS 11 THRU 12	
MAINTENANCE INSTRUCTIONS	11-1

FOLDOUTS
EQUIPMENT LOCATION DIAGRAMS

This copy is a reprint which includes current pages from Changes 1 and 2.

TECHNICAL MANUAL

DIRECT SUPPORT
AND GENERAL SUPPORT
MAINTENANCE MANUAL

PART 3
MAINTENANCE

TURRET
FOR TANK, COMBAT,
FULL-TRACKED:
105-MM GUN,
M60A1 (RISE)
(2350-00-116-9765)
AND
M60A1 (RISE PASSIVE)
(2350-01-059-1503)

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1980

D 101. 11:

READEX FICHE best copy available

WARNING

BE CAREFUL: CARBON MONOXIDE IS A GAS THAT CAN KILL YOU

Carbon monoxide always comes when something gets hot or burns - such as heaters, engines, etc. To keep carbon monoxide from making anyone sick or drowsy, there must be plenty of fresh air in the place where the heating or burning takes place. This gas has no color and no smell, but it is deadly poisonous. It can damage your brain, or kill you, if you do not have enough fresh air coming in to push the carbon monoxide out.

Follow these rules to keep from getting poisoned:

1. Do not operate engine or heater inside a building unless there is plenty of fresh air coming in.
2. Do not idle an engine unless you are sure there is plenty of fresh air in personnel compartments.
3. Do not drive a vehicle which has inspection plates, cover plates or engine compartment doors taken off, except for very short maintenance times when necessary.
4. When operating vehicle, always be on the lookout for personnel who seem to be getting sick or drowsy. If you notice this happening, immediately get fresh air into personnel compartments. If this does not help, remove sick or drowsy personnel from vehicle and do following:
    a. Put him into fresh air.
    b. Keep him covered warm.
    c. Keep him still. Do not let him exercise. (Exercise will make him worse.)
    d. Give him artificial respiration, if necessary.
    e. Get medical help.

* TM 9-2350-257-34-2-3

Technical Manual
No. 9-2350-257-34-2-3

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C., 11 July 1980

Technical Manual Direct Support and General Support Maintenance

TURRET

FOR TANK, COMBAT,

FULL-TRACKED:

105-MM GUN,

M60A1 (RISE)
(2350-00-116-9765)
AND
M60A1 (RISE PASSIVE)
(2350-01-059-1503)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know.

Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to:

Commander
U.S. Army Armament, Munitions and Chemical Command
ATTN: AMSMC-MAS
Rock Island, IL 61299-6000

A reply will be furnished to you.

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* This manual in conjunction with TM 9-2350-257-34-2-1, TM 9-2350-257-34-2-2, TM 902350-257-34-2-4, TM 9-2350-257-34-2-5, and TM 9-2350-257-34-2-6 supersedes TM 9-2350-257-34-2, December 1975, and so much of the DS/GS portion of TM 9-1000-213-35, April 1976, as pertains to the M60A1 (RISE) and M60A1 (RISE PASSIVE) Tanks, including all changes.

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CHAPTER 11

105-MM COMBINATION GUN MOUNT

Section 1. SCOPE

11-1. LIST OF EQUIPMENT ITEMS CONTAINED IN THIS CHAPTER

Section	Equipment Item	Paragraph
2	Cannon Tube (M68)	11-2
3	Cannon Tube (M68) and Combination Gun Mount M140	11-6
4	Replenisher	11-32

Section 2. CANNON TUBE M68

11-2. MAINTENANCE PROCEDURES INDEX

Equipment Item	Inspection	Tasks Removal	Installation
Cannon Tube	11-3	11-4	11-5

11-3. CANNON TUBE INSPECTION PROCEDURE

TOOLS: Scraper
Stiff bristled brush
Fine stone
Wood block (4" x 4" x 41" Long)
5/8" combination wrench
9/16" combination wrench
11/16" combination wrench
M3 oil pump
Pressure gauge (0 to 3000 psi)
5/16" socket head screw key (Allen wrench)
Spanner wrench (12251792 Modified) (item 24, App. B)
5/16" flat tip screwdriver
3/8" drive torque wrench (0 to 50 foot-pounds)
5/16" flat tip screwdriver (with 3/8" drive end)
5/16" hex head socket (3/8" drive)
3/4" drive torque wrench (0 to 600 foot-pounds)
12" ruler

SUPPLIES: Pencil
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)
Grease (item 12, App. A)
Preformed packing (MS 28778-4)
Nipple (MS 51856-6)
Hydraulic fluid (item 10, App. A)
Rags (item 21, App. A)

PERSONNEL: One

REFERENCES: DA Form 2408-4
TM 9-1000-202-14 for procedures to:
- Do borescope inspection of cannon bore
- Evaluate cannon tube

TM 9-2350-257-10 for procedures to:
- Clean cannon tube
- Depress cannon tube
- Drain and refill replenisher

JPG for procedures to:
- Clean parts
- Inspect and repair parts
- Apply grease
- Use torque wrench
- Use M3 oil pump

EQUIPMENT CONDITION: Cannon tube cleaned (TM-10)
Depress gun tube slightly below 0 mils (TM-10)
Drain replenisher (TM-10)

11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

GENERAL INSTRUCTIONS:

NOTE

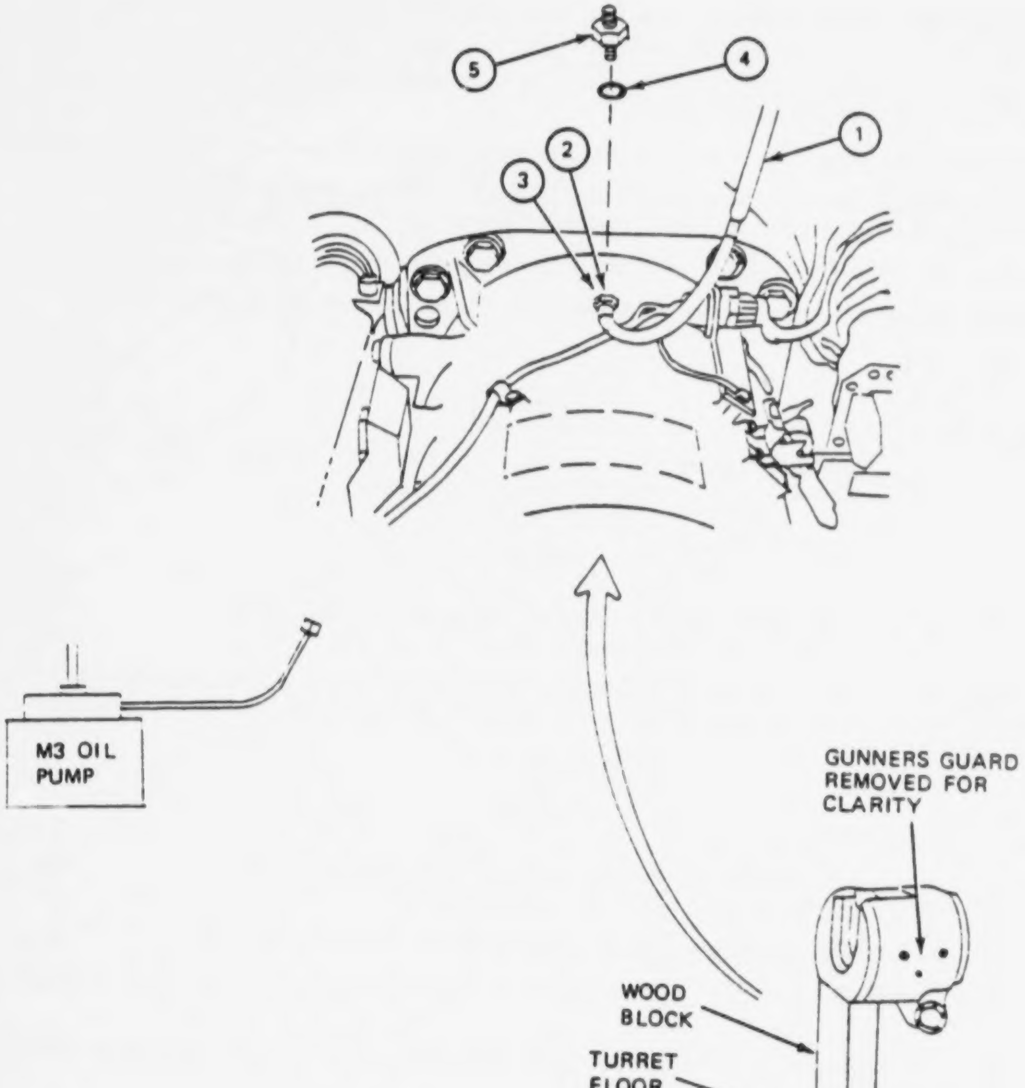
If cannon tube has not been removed or replaced for maintenance service within period of one year, following procedure will be performed.
Use rags for fluid spillage.

Para 11-3 Cont

11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

FRAME 1

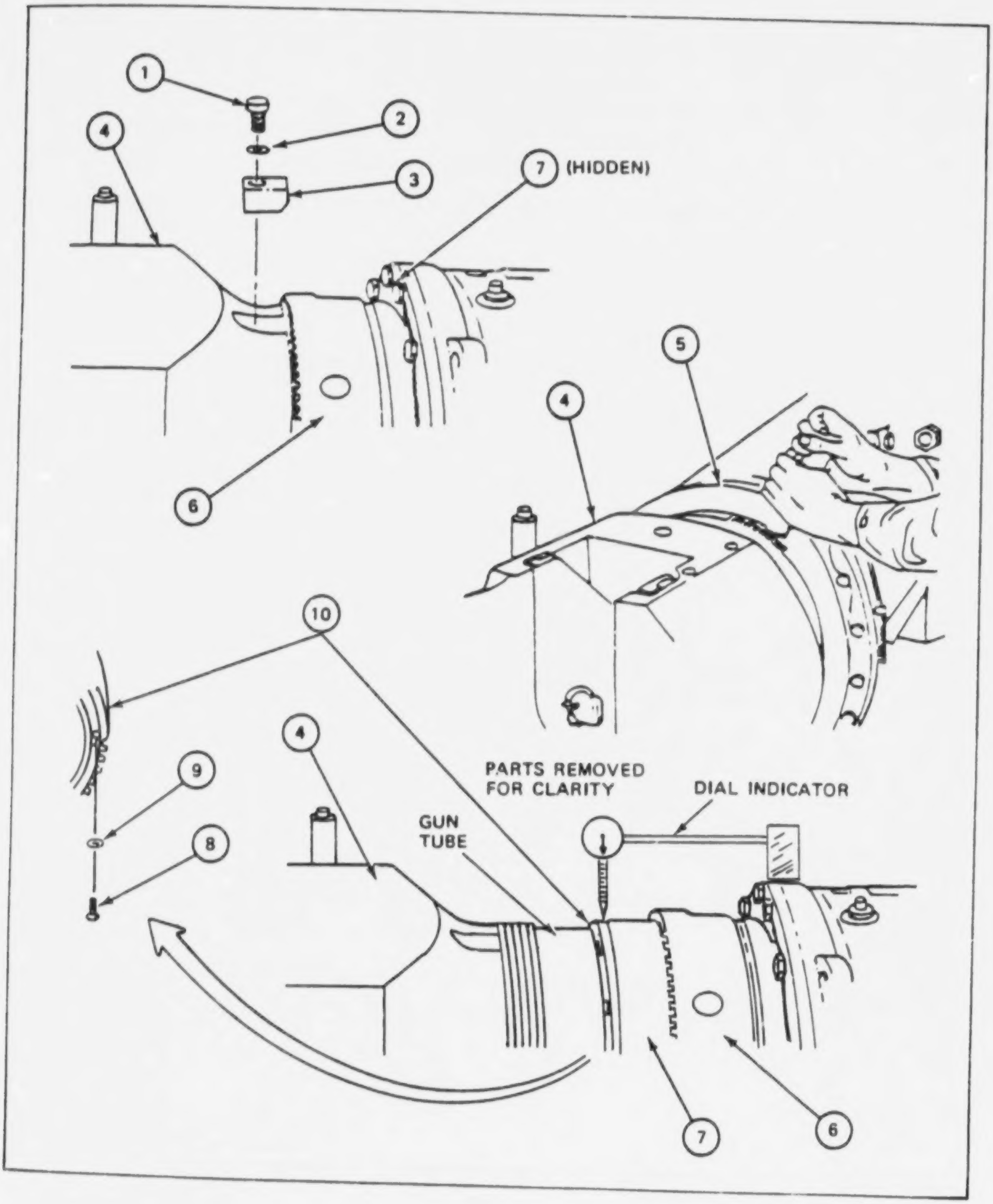
Step	Procedure
	NOTE Some hose connectors require a 9/16" wrench and others a 5/8" wrench.
1.	Using appropriate wrench, disconnect replenisher hose (1) from elbow (2). Remove hose from combination gun mount (3).
2.	Using appropriate wrench, remove elbow (2) from combination gun mount (3).
3.	Lightly coat preformed packing (4) with hydraulic fluid.
4.	Put preformed packing (4) on nipple (5).
5.	Using 11/16" wrench, put nipple (5) in combination gun mount (3).
6.	Assemble M3 oil pump.
7.	Connect hose from M3 oil pump to nipple (5).
8.	Using M3 oil pump, increase pressure and pump gun out of battery about 12" (JPG). GO TO FRAME 2


5
4
1
2
3
M3 OIL
PUMP
GUNNERS GUARD
REMOVED FOR
CLARITY
WOOD
BLOCK
TURRET
FLOOR

11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

FRAME 2

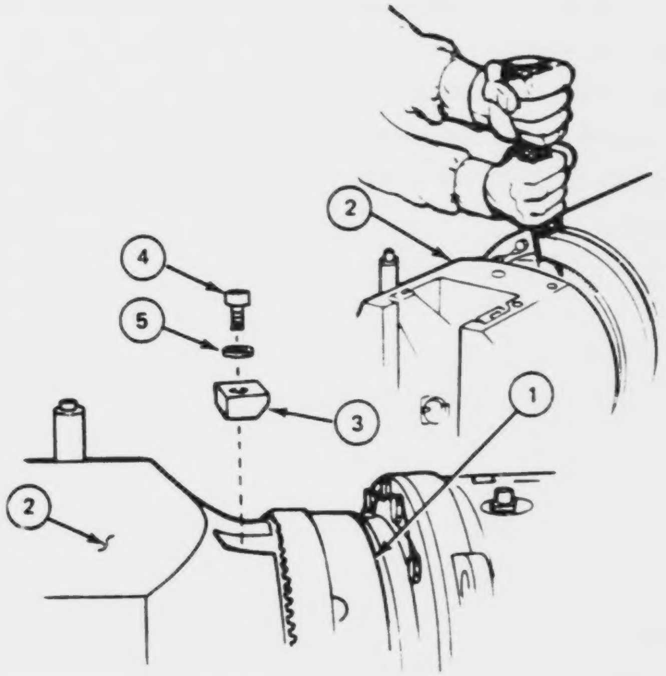
Step	Procedure
1.	Using Allen wrench, remove screw (1), lockwasher (2) and breech lock (3) from breech ring (4).
2.	Using spaner wrench (5), unscrew collar (6) from breech ring (4) and slide collar (6) forward only from breech ring.
3.	Using M3 oil pump, decrease pressure and return gun halfway to battery position (JPG).
4.	Inspect threads of collar (6), breech ring (4) and abutting surfaces of recoil piston (7) and breech ring (4) for rust and corrosion (JPG).
5.	Clean all surfaces thoroughly and lubricate lightly with grease (JPG).
6.	Using screwdriver, remove screw (8) and key (9) from recoil piston adaper (10).
	CAUTION Do not remove recoil piston adapter (10) to perform check.
	NOTE This step requires support shop work team with precision measuring tools.
7.	Using dial indicator, check for diametrical movement of recoil piston adapter (10) to recoil piston (7) of no more than 0.018". Replace bad parts for excessive movement (para 11-17 and 11-18).
	NOTE Piston adapter surface must be flush to 0.01" below piston surface before key (9) is installed.
8.	Using screwdriver, install key (9) on piston adapter (10) with screw (8).
9.	Using screwdriver and 3/8" drive torque wrench, torque screw (8) to 5 to 7 foot-pounds (JPG).
10.	Using M3 oil pump, increase pressure and pump gun out of battery until recoil piston (7) touches breech ring (4) (JPG). GO TO FRAME 3


7 (HIDDEN)
PARTS REMOVED FOR CLARITY
DIAL INDICATOR
GUN TUBE

11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using hands, screw adapter collar (1) on breech ring (2).
2.	Using spanner wrench, tighten adapter collar (1) on breech ring (2).
3.	Using 3/4" torque wrench and spanner wrench, tighten collar (1) to between 500 and 510 foot-pounds (JPG).
	NOTE If lock (3) will not fit in collar (1), tighten collar (1) until it does. If this can't be done, loosen collar (1) just enough to have lock (3) fit.
4.	Using Allen wrench, attach lock (3) to breech ring (2) with screw (4) and lockwasher (5).
5.	Using hex head socket and 3/8" torque wrench, tighten screw (4) to between 30 and 45 foot-pounds (JPG).
	GO TO FRAME 4



11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using hands, screw adapter collar (1) on breech ring (2).
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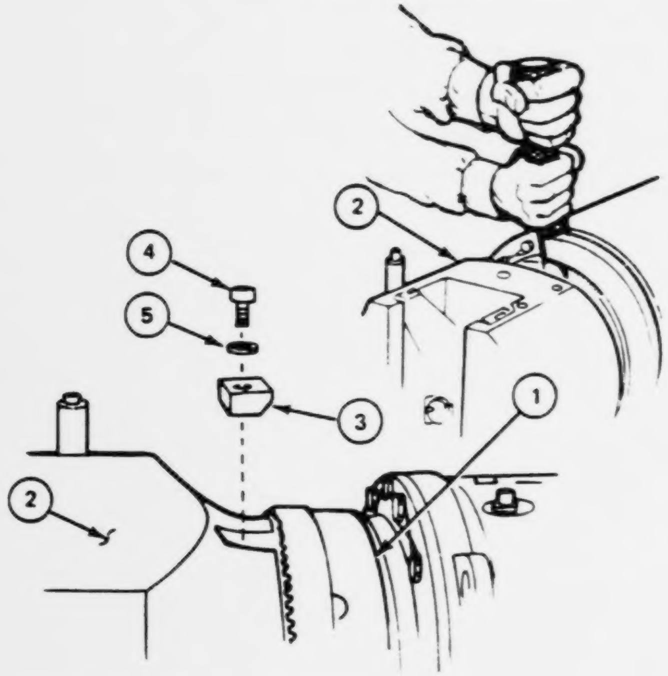
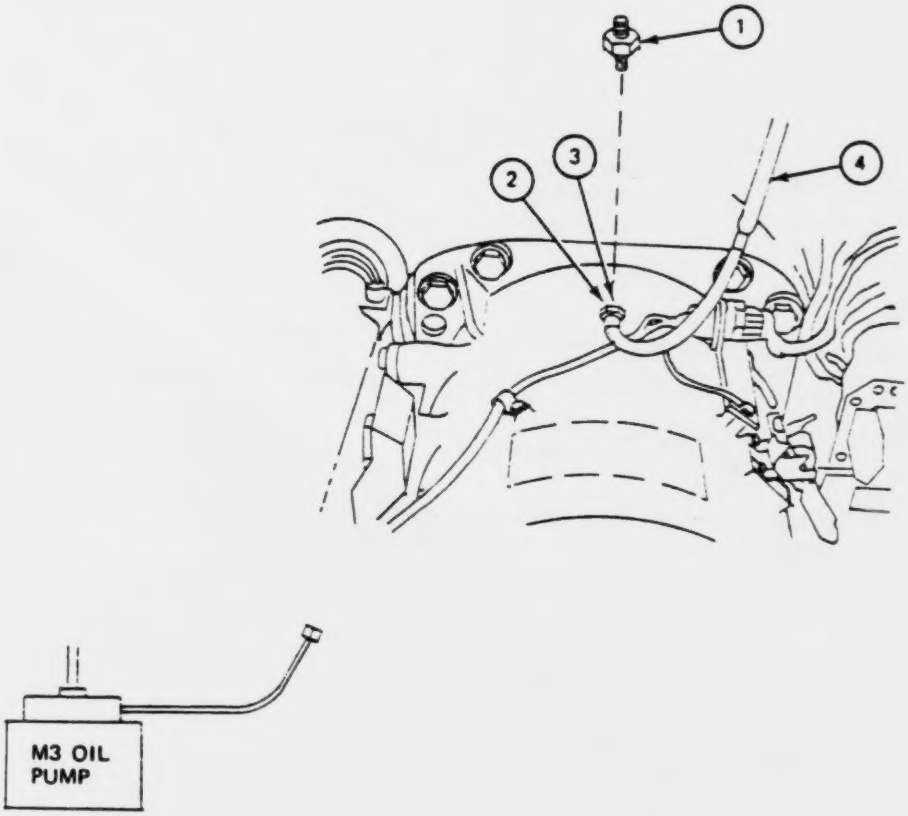
5.	Using hex head socket and 3/8" torque wrench, tighten screw (4) to between 30 and 45 foot-pounds (JPG).
	GO TO FRAME 4



11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using M3 oil pump, decrease pressure and return gun to battery (JPG).
2.	Disconnect hose from M3 oil pump to nipple (1) on combination gun mount (2).
3.	Disassemble M3 oil pump.
4.	Using 11/16" wrench, remove nipple (1) from combination gun mount (2).
	NOTE Some hose connectors require a 9/16" wrench and other a 5/8" wrench.
5.	Using appropriate wrench, connect elbow (3) to combination gun mount (2).
6.	Using appropriate wrench, connect replenisher hose (4) to elbow (3).
7.	Fill replenisher (TM-10).
	NOTE It may be necessary to manually depress gun (TM-10).
8.	Remove block from under breech ring.
9.	Remove cannon tube (quick change method) (para 11-4).
10.	Check for unusual wear or damage to cannon tube bore (TM-14).
11.	Check cannon bore to determine usability and remaining round life (TM-14). GO TO FRAME 5


M3 OIL
PUMP

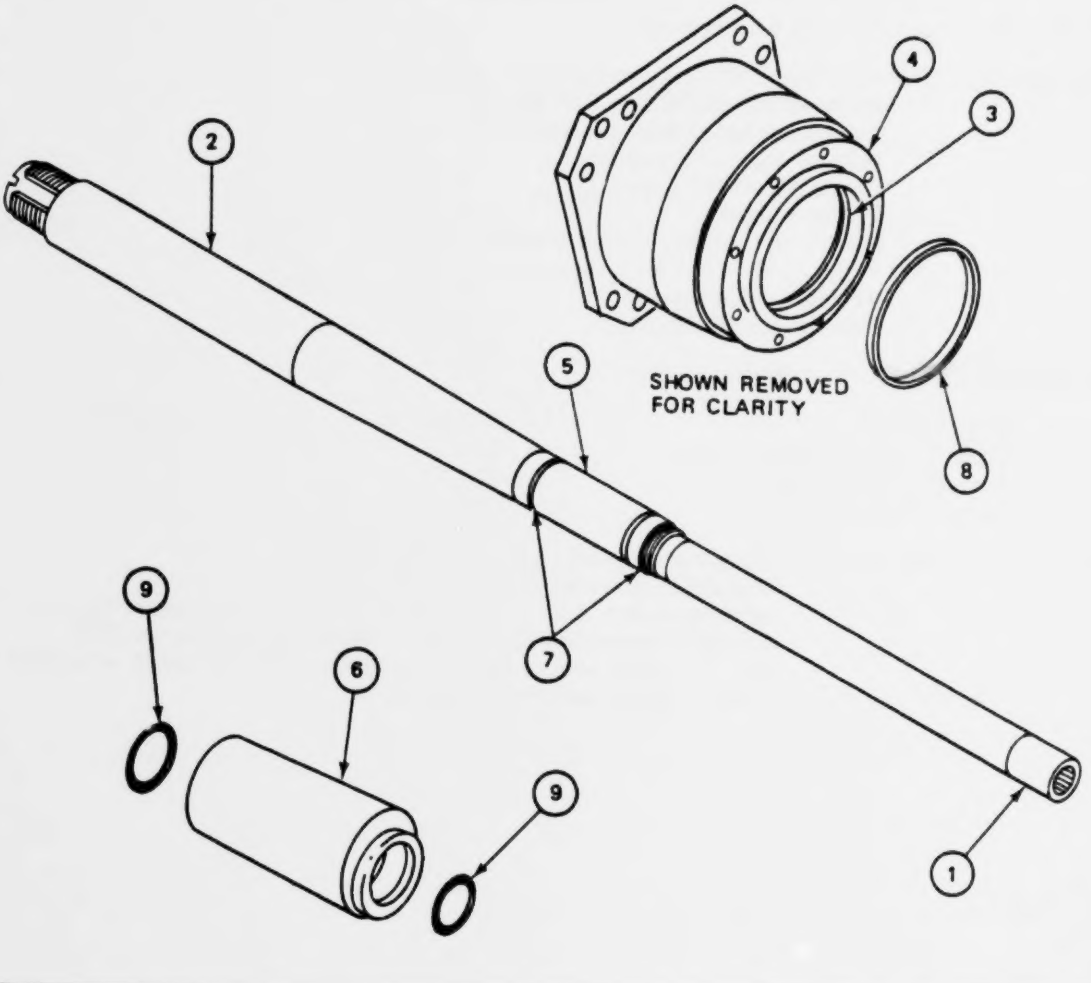
11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

FRAME 5

Step	Procedure
	NOTE If cannon bore is determined not usable, cannon tube must be replaced. If cannon bore is determined usable, continue with following inspection.
1.	Check muzzle end (1) for cracks in cannon tube wall (JPG).
	NOTE For steps 2 and 3, ir rust, pitting, or corrosion covers more than 20 percent of machined surface area, report condition with supporting photographs to: Commander Watervliet Arsenal Attn: SARWV-QAR Watervliet, NY 12189
2.	Check outside machined surface section (2) for rust or corrosion (JPG).
3.	Check inside surfaces of support sleeve (3) in recoil mechanism (4) for rust or corrosion (JPG).
	NOTE If rust or pitting covers more than 80 percent of surfaces under evacuator chamber (6) or when single pit exceeds depth of 1/8'' (0.125''), cannon tube must be replaced.
4.	Check surface (5) under evacuator chamber (6) for rust or pitting (JPG).
	NOTE If gas leakage shown by dark colors caused by smoke is detected, cannon tube must be replaced. Two preformed packings (9) in evacuator chamber (6) must be in serviceable condition.
5.	Check for evidence of gas leakage on cannon tube outside evacuator chamber sealed surfaces (7).
6.	Remove rust, corrosion, pits and all sharp edges in pitted areas from outside surface (2) and (5) of cannon tube (JPG).
7.	Inspect seal quadrant ring (8) in support sleeve (3).

11-3. CANNON TUBE INSPECTION PROCEDURE (CONT)

Step	Procedure
8.	Lightly grease unpainted parts of support sleeve (3) (JPG).
9.	Install cannon tube (quick change method) (para 11-5).
10.	Using pencil, write down checks and repairs made in REMARKS column of DA Form 2408-4 in equipment log book. END OF TASK


4
3
2
5
SHOWN REMOVED FOR CLARITY
8
9
6
7
9
1

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD)

TOOLS: Girth Wrench, NSN 4933-00-775-3745
Movable hoist, (one ton capacity)
Guide rope (20' long)
Sling - rubber coated wire mesh, one ton capacity,
(NSN 4933-00-699-9309)
9/16" socket head screw key (Allen wrench)
Tape measure (6 feet)
8" x 8" x 24" wood blocks (two) (fabricated tool, item 10, App. B)
8" x 8" x 24" wood blocks (four)

SUPPLIES: 3/8"-16 NC x 1-1/2" Bolt
Chalk

PERSONNEL: Four (including hoist operator)

REFERENCES: TM 9-2350-257-10 for procedures to:
- Set turret traverse lock to LOCKED
- Clear ammunition from cannon
- Remove evacuator chamber
- Operate 105-MM cannon
- Traverse turret
- Elevate and depress cannon manually

TM 9-2350-257-20-2-3 for procedures to:
- Remove loader's guard
- Remove gun shield cover

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6

EQUIPMENT CONDITION: Evacuator chamber removed (TM-10)
Gun shield cover removed (TM-20-2-3)
All ammunition cleared from breech chamber and cannon (TM-10)
Gunner's control box ELEV/TRAV POWER switch set to OFF
Driver's master control panel MASTER BATTERY switch set to OFF
Loader's guard removed (TM-20-2-3)

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD) (CONT)

GENERAL INSTRUCTIONS:

NOTE

In addition to tasks inside vehicle, soldiers should do following jobs outside vehicle:

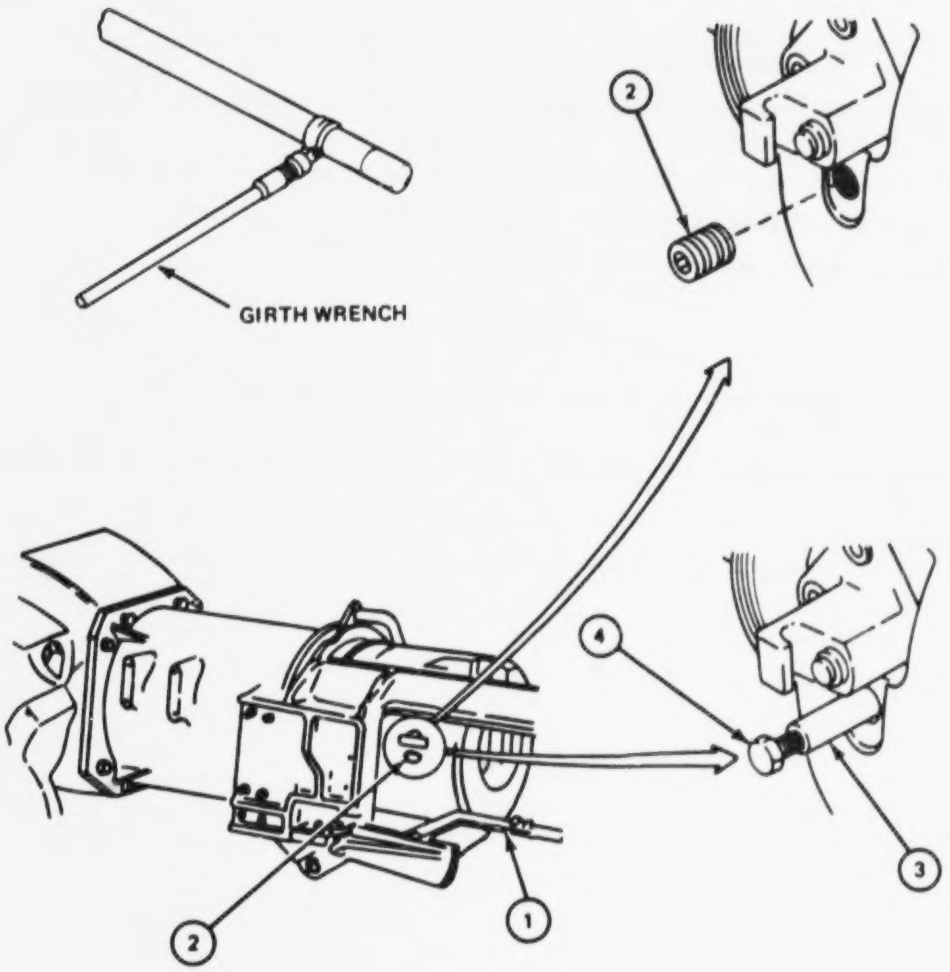
1. Hoist equipment operator to move cannon out of vehicle and lower it.
2. Use two soldiers on guide ropes to control tube movement.
3. Use one soldier on girth wrench to unlock tube and check LOCKED and UNLOCKED marks on cannon tube and gun shield.

Para 11-4 Cont

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 1

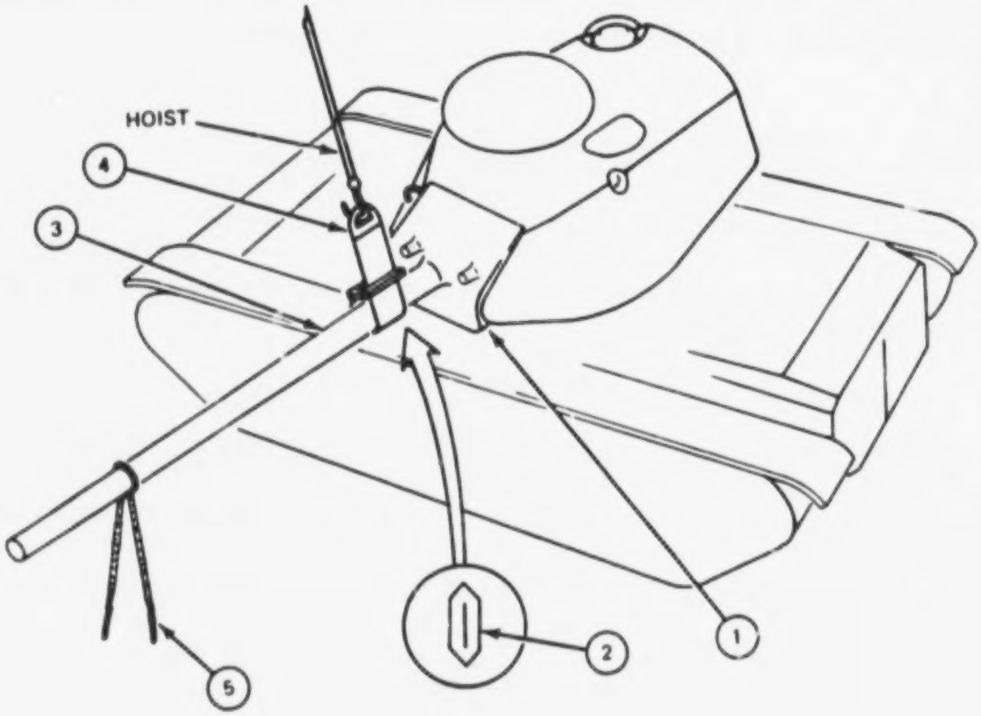
Step	Procedure
	WARNING
	Make sure area is clear to traverse turret. Turret can hurt you when traversed.
1.	Traverse turret until cannon is to side of vehicle (TM-10).
2.	Set turret traverse lock to LOCKED (TM-10).
3.	Bring cannon to 0 degrees elevation (TM-10).
	WARNING
	Open breech can cause injury in case of accidental closing. Keep hands out of open breech.
4.	Open breech and put breech operating lever (1) in unlatched position (TM-10).
5.	Using Allen wrench, remove locking pin plug (2).
	NOTE
	It may be necessary to turn cannon tube slightly in either direction (with a girth wrench on outside) to free locking pin (3).
6.	Screw 3/8" bolt (4) into tapped hole in locking pin (3) and pull out pin.
	WARNING
	Breech is still open. Keep hands out of breech in case of accidental closing.
7.	Return breech operating lever (1) to latched position (TM-10).
	GO TO FRAME 2


GIRTH WRENCH

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 2

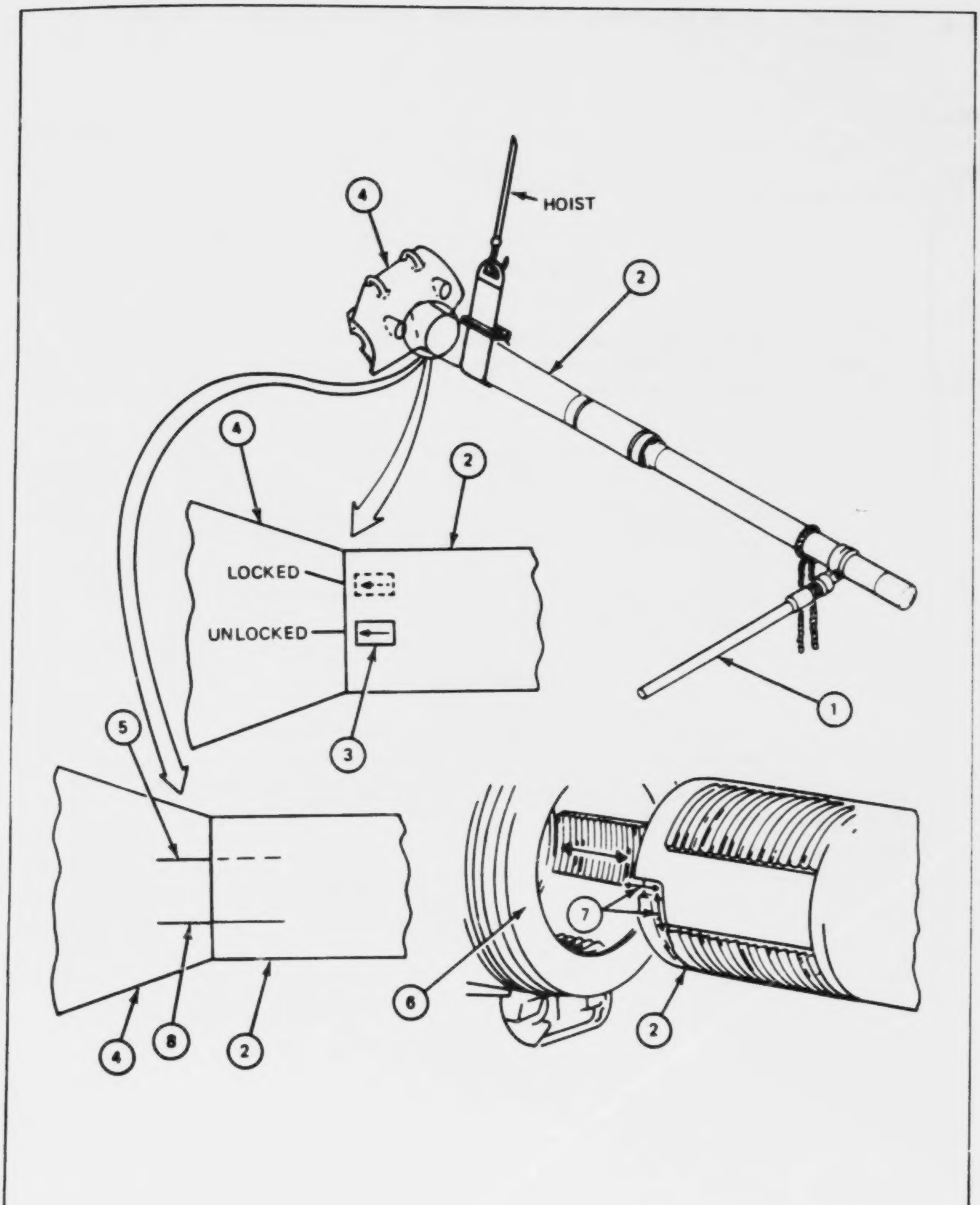
Step	Procedure
	NOTE Center of balance mark (2) should be about 19 inches from gun shield (1).
1.	Using tape, measure about 19 inches from gun shield (1) to locate center of balance mark (2) on cannon tube (3).
2.	Attach one end of sling (4) around cannon tube at center of balance mark (2).
3.	Attach other end of sling (4) to hoist.
4.	Raise hoist to remove all slack from sling (4).
	NOTE Guide rope (5) is used to keep cannon tube from moving.
5.	Using tape, measure about 36 inches from muzzle end and attach guide rope (5) around cannon tube (3).
	GO TO FRAME 3


HOIST

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 3

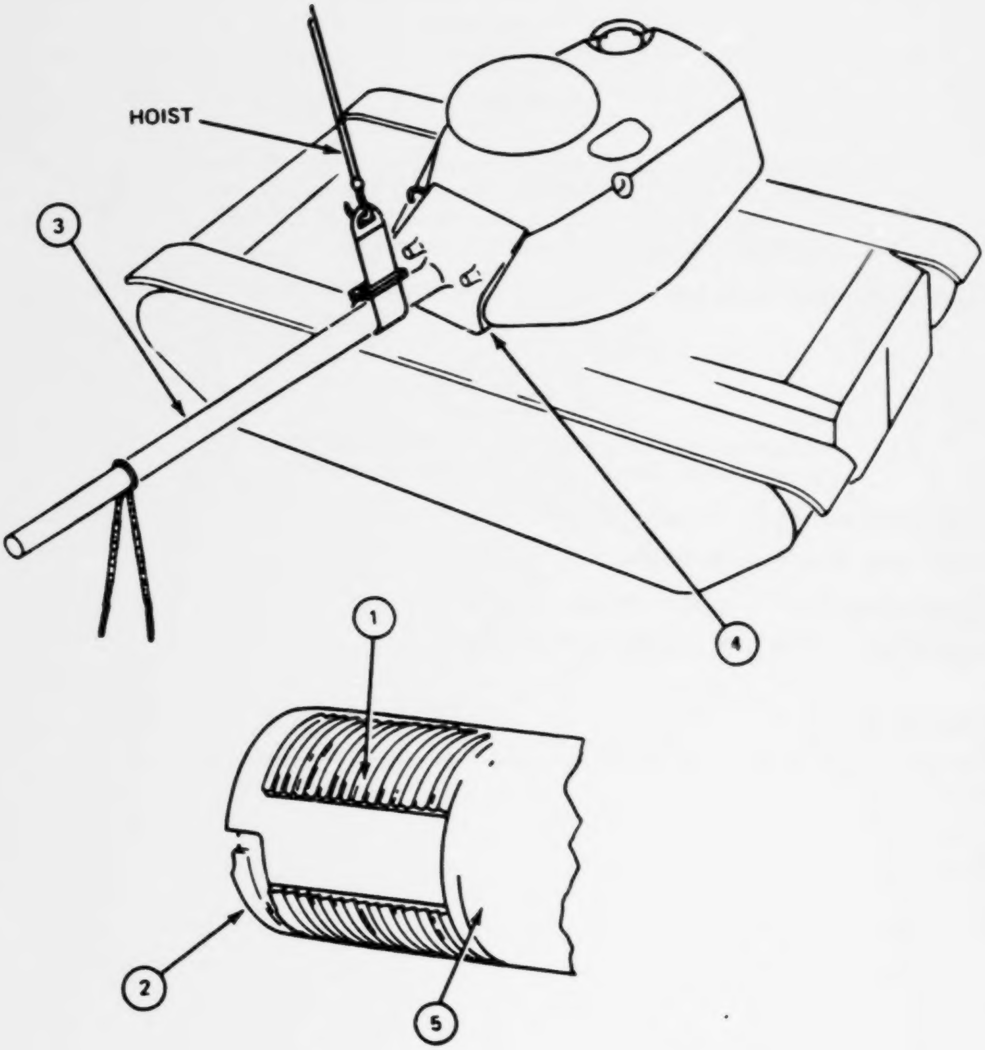
Step	Procedure
1.	Place girth wrench (1) on cannon tube (2) two feet from muzzle end.
	NOTE Arrow mark (3) on cannon tube (2) and marks on gun shield (4) show LOCKED and UNLOCKED positions. If positions and marks are present, do steps 3, 4, and 6. If positions and marks are not present, do steps 2, 3, 5, and 6.
2.	Using chalk, mark a 2 inch line (5) across cannon tube (2) and gun shield (4) to show locked position.
	NOTE Stud in breech ring (6) rides in keyway (7) as cannon tube (2) is turned and pulled out.
3.	Using girth wrench (1), turn cannon tube (2) 1/8 turn or 45 degrees counterclockwise (as seen looking toward breech end).
4.	Check that arrow mark (3) on cannon tube (2) is pointing to UNLOCKED mark on gun shield (4).
5.	Using chalk, mark a 1 inch line (8) on gun shield (4) to line up with chalk mark on cannon tube (2) (made in step 2) to show unlocked position.
6.	Remove girth wrench (1).
	GO TO FRAME 4


HOIST
LOCKED
UNLOCKED

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 4

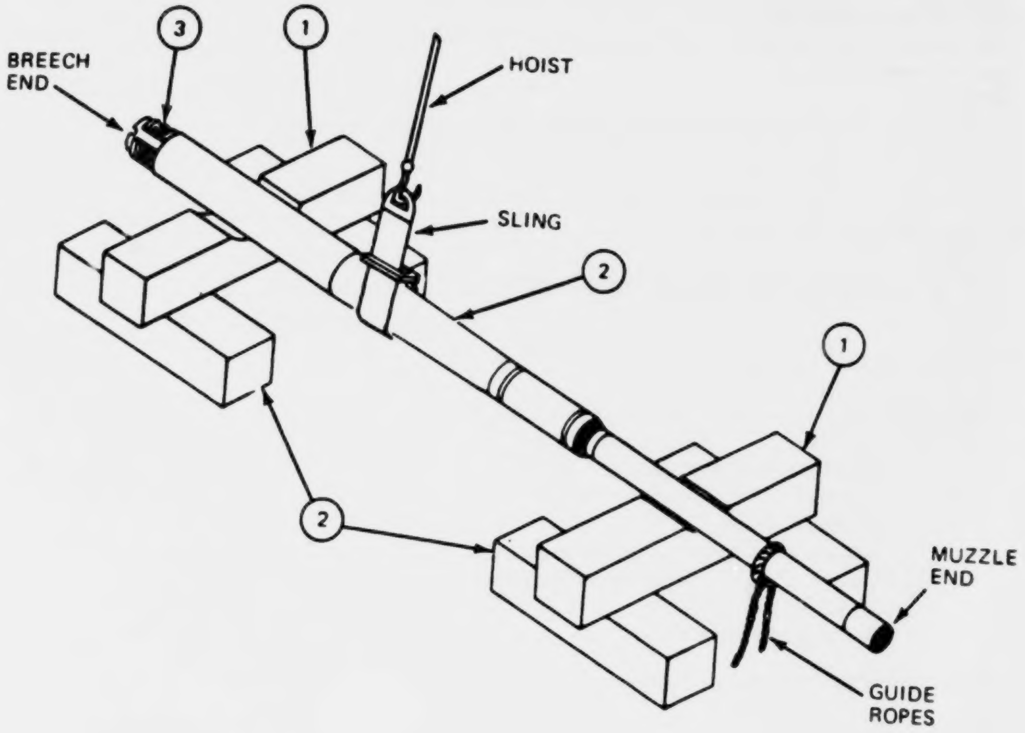
Step	Procedure
	WARNING Cannon tube is very heavy. Stay clear of cannon tube when it is being lifted by hoist. If cannon tube slips or falls, it can hurt you. **CAUTION** Buttress threads (1) damage easily. Use care in pulling breech end (2) of cannon tube (3) through gun shield (4). Be careful not to damage or scratch machined surface (5) of cannon tube (3) during removal. **NOTE** It may be necessary to raise or lower hoist to remove cannon tube.
1.	Using hoist and guide ropes, slowly pull cannon tube (3) out until breech end (2) is clear of gun shield (4) and vehicle. GO TO FRAME 5


HOIST

11-4. CANNON TUBE REMOVAL PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 5

Step	Procedure
	NOTE Make sure wood blocks (1) are placed so that the one marked MUZZLE END will be under the muzzle end of cannon tube (2) and the one marked BREECH END will be under the breech end of cannon tube.
1.	Using guide ropes, place cannon tube (2) over wood blocks (1).
	CAUTION Before lowering cannon tube (2), make sure blocks (1) are placed so that threads (3) do not rest on block.
2.	Using hoist, lower cannon tube (2) to wood blocks (1).
3.	Lower hoist to give slack in sling.
4.	Remove sling from hoist and cannon tube (2).
5.	Remove guide rope from cannon tube (2).
	END OF TASK


3
1
BREECH END
HOIST
SLING
2
1
2
MUZZLE END
GUIDE ROPES

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD)

TOOLS: Girth wrench (NSN 4933-00-775-3745)
Movable hoist equipment (one ton capacity)
Guide rope
8" x 8' x 24" wood blocks (four)
Sling - rubber coated wire mesh, one ton capacity,
(NSN 4933-00-699-9309)
9/16" socket head screw key (Allen wrench)
Tape measure (6 feet)
Flashlight
8" x 8" x 24" wood blocks (two) (fabricated tool, item 10, App. B)

SUPPLIES: Grease (item 12, App. A)
Chalk
Replacement cannon tube for 105-MM Cannon (M68) (8765961)

PERSONNEL: Four (including hoist operator)

REFERENCES: JPG for procedure to clean metal surfaces
TM 9-2350-257-10 for procedures to:
- Install evacuator chamber
- Operate 105-MM cannon M68
- Traverse turret
- Elevate and depress cannon manually

TM 9-2350-257-20-2-3 for procedures to:
- Install loader's guard
- Install gun shield cover

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
Turret Traverse Lock	FO-4	6

EQUIPMENT CONDITION: Gunner's control box ELEV/TRAV POWER switch set to OFF
Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD) (CONT)

GENERAL INSTRUCTIONS:

NOTE

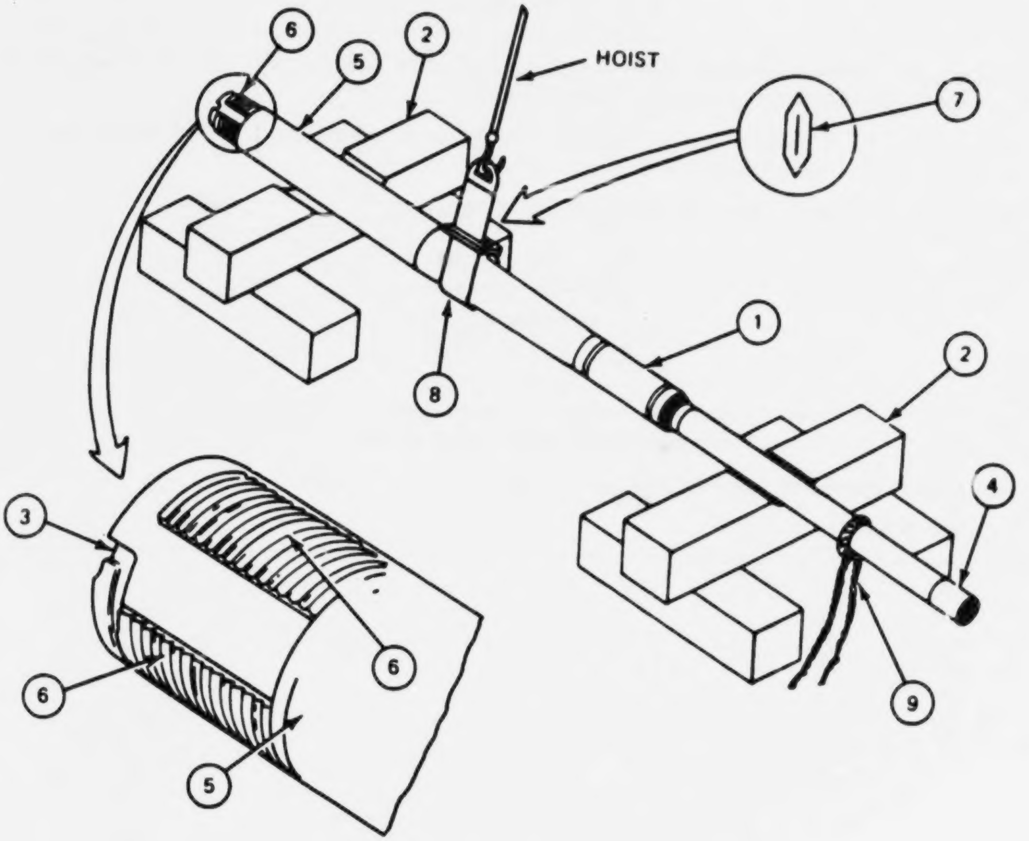
In addition to tasks inside vehicle, soldiers should do following tasks outside vehicle.

1. Hoist equipment operator to raise and lower cannon tube and move it into vehicle.
2. Use two soldiers on guide ropes to control tube movement.
3. Use one soldier on girth wrench to lock tube and check LOCKED and UNLOCKED marks on cannon tube and gun shield.

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 1

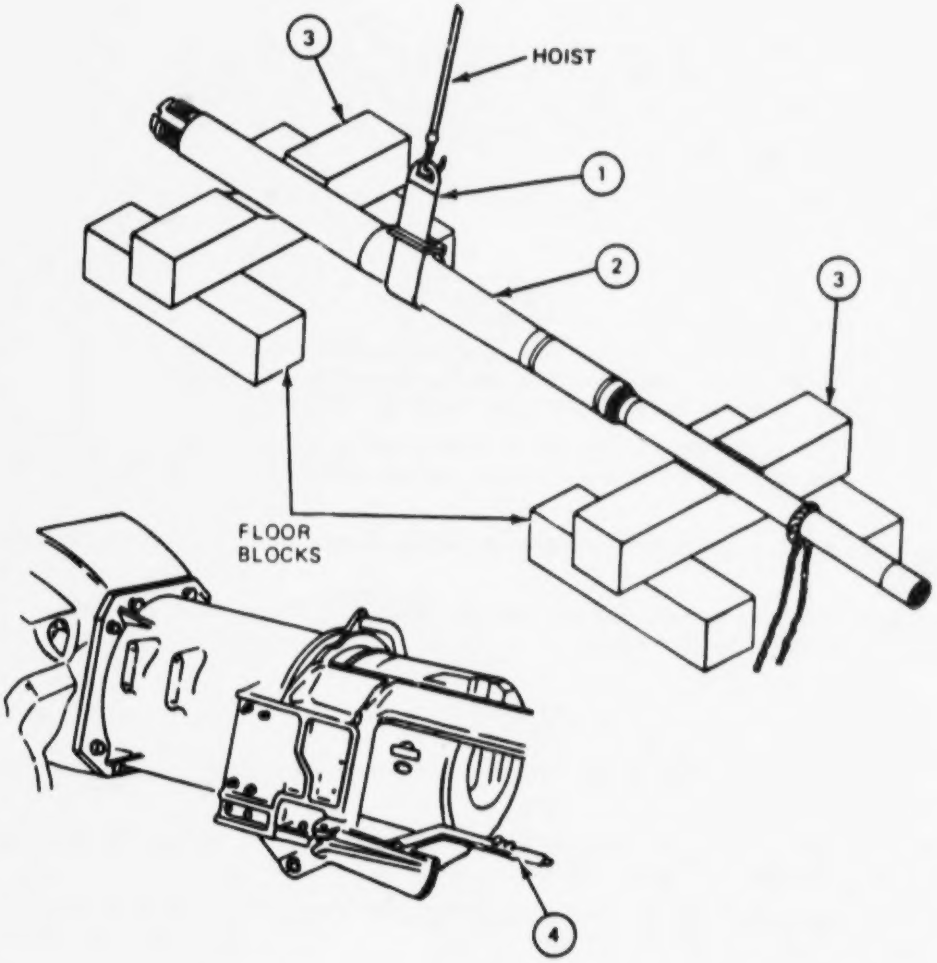
Step	Procedure
	WARNING Make sure area is clear to traverse turret. Turret can hurt you when traversed.
1.	Traverse turret, if necessary, so that gun shield opening is at side of vehicle (TM-10).
2.	Have cannon tube (1) placed on wood blocks (2) so that keyway (3) is facing right side, looking toward muzzle end (4).
	CAUTION Machined surface (5) scratches easily. Use care when removing protective coating and greasing machined surface. **NOTE** Do step 3 if replacement cannon tube is to be installed.
3.	Clean cannon tube (1) outside surface to remove protective coating and dry thoroughly (JPG).
4.	Put a light coat of grease on machined surface (5) (JPG).
5.	Put a heavy coat of grease on buttress threads (6) (JPG).
6.	Using tape, measure 79 inches from breech end to find center of balance mark (7).
7.	Attach sling (8) around cannon tube at center of balance mark.
8.	Attach hoist to sling (8). Do not take up slack in sling.
9.	Using tape, measure 36 inches from muzzle end (4) and attach guide rope (9) to cannon tube (1).
	GO TO FRAME 2


HOIST

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 2

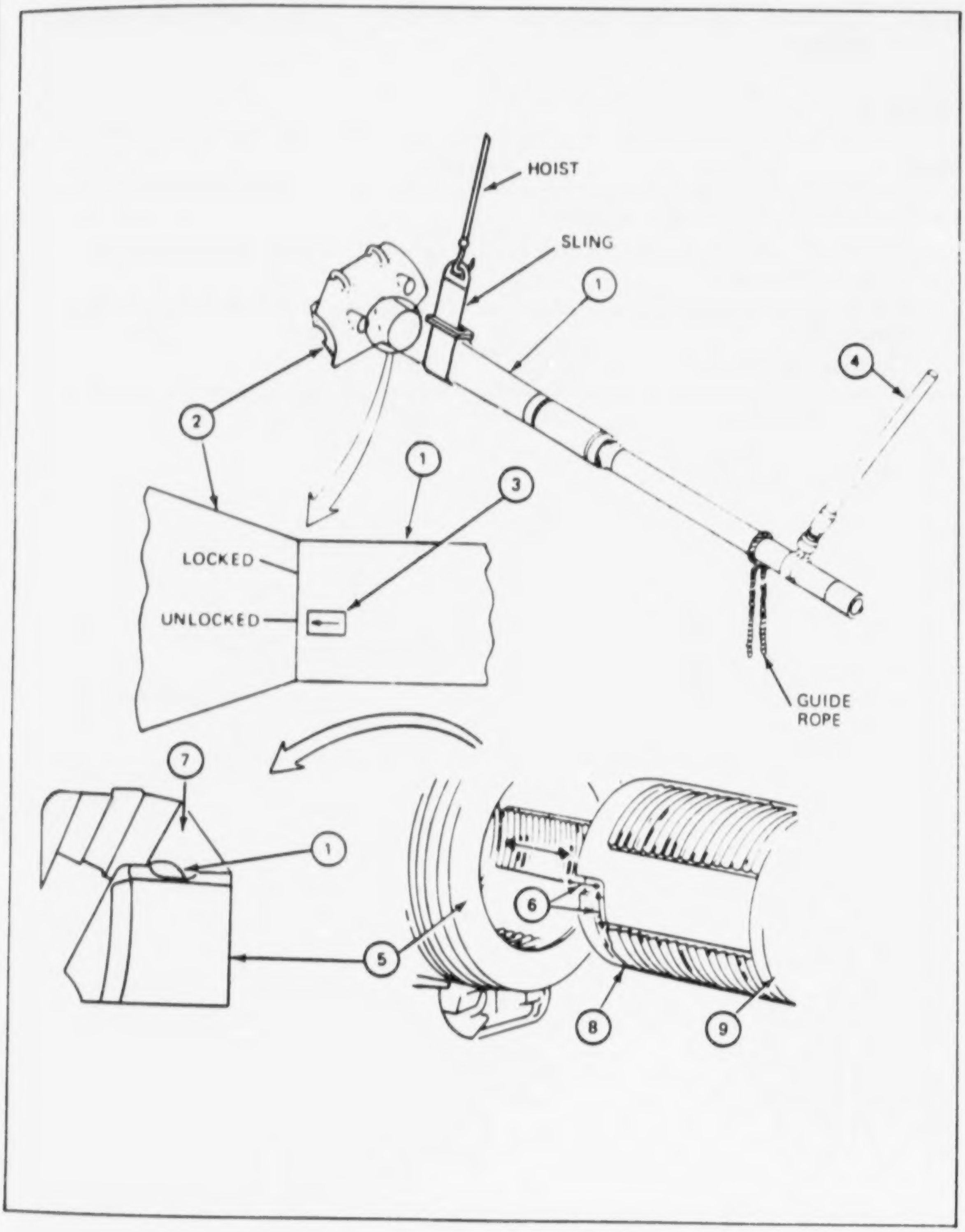
Step	Procedure
1.	Using hoist, remove all slack from sling (1) and raise cannon tube (2) off wood blocks (3) just high enough to check for correct balance.
2.	If not balanced correctly, lower cannon tube (2) to wood blocks (3) and move sling (1) on cannon tube for correct balance.
3.	Repeat steps 1 and 2 until correct balance is obtained. **WARNING** Open breech can cause injury in case of accidental closing. Keep your hands out of open breech.
4.	Put breech operating lever (4) in unlatched position (TM-10). GO TO FRAME 3


HOIST
FLOOR BLOCKS

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD (CONT)

FRAME 3

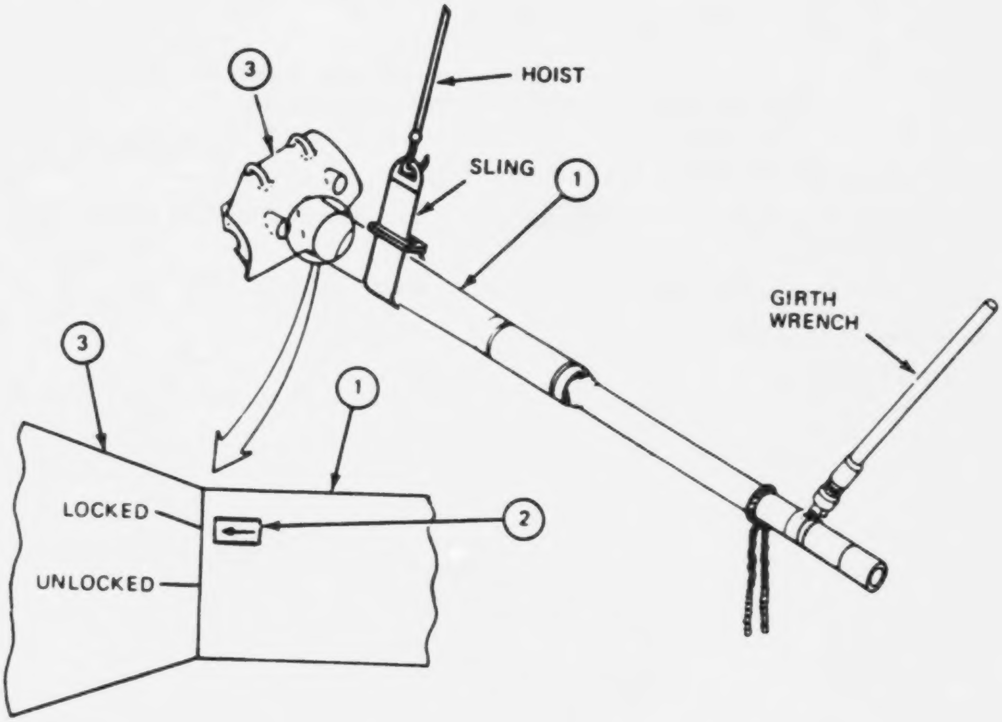
Step	Procedure
	NOTE Index marks on cannon tube (1) and gun shield (2) show LOCKED and UNLOCKED position. If marks are not present, alignment of keyway (6) with stud in breech ring (5) must be checked from inside turret using a flashlight.
1.	Using hoist, raise cannon tube (1) to height of gun shield (2) opening.
	CAUTION Buttress threads (8) and machined surface (9) can be damaged and scratched easily. Use care in sliding cannon tube (1) through gun shield (2) opening.
2.	Using hoist and guide rope, slowly guide breech end of cannon tube (1) through gun shield (2) opening until arrow mark (3) on cannon tube (1) is about 18 inches from gun shield (2).
3.	Using tape measure, place girth wrench (4) about 2 feet from muzzle end of cannon tube (1).
4.	Using girth wrench (4), turn cannon tube (1) to line up arrow mark (3) with UNLOCKED mark on gun shield (2).
	NOTE Stud in breech ring (5) rides in keyway (6) as cannon tube (1) is pushed in and turned.
5.	Using hoist and guide rope, continue to move cannon tube (1) straight in until stud in breech ring (5) rides in keyway (6) as far as it will go and then stops.
6.	Using flashlight inside turret, check that cannon tube (1) is fully seated in breech ring (5) and flush with breech face (7). GO TO FRAME 4


HOIST
SLING
①
④
②
①
③
LOCKED
UNLOCKED
GUIDE ROPE
⑦
①
⑥
⑤
⑧
⑨

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD) (CONT)

FRAME 4

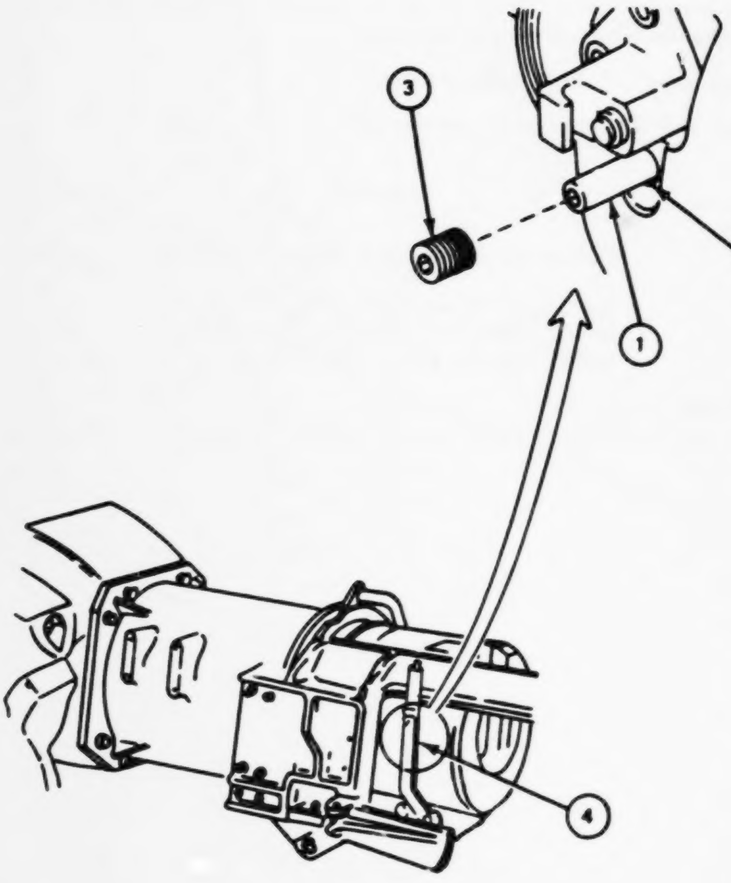
Step	Procedure
1.	Lower hoist to allow slack in sling.
2.	Using girth wrench, turn cannon tube (1) 1/8 turn or 45 degrees clockwise (looking toward breech end).
3.	Check that arrow mark (2) on cannon tube (1) is pointing to LOCKED mark on gun shield (3). GO TO FRAME 5


3
HOIST
SLING
1
GIRTH
WRENCH
3
1
LOCKED
2
UNLOCKED

11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD (CONT)

FRAME 5

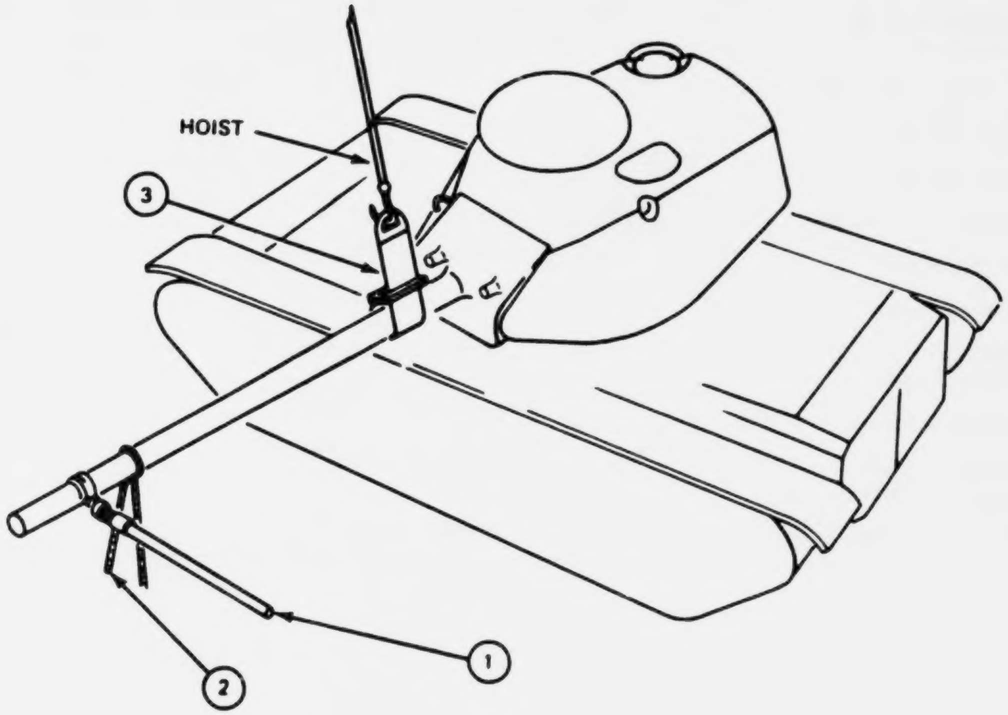
Step	Procedure
	NOTE It may be necessary to turn cannon tube slightly in either direction with girth wrench to let locking pin (1) seat properly.
1.	Slide locking pin (1) in hole (2) in breech ring.
2.	Using Allen wrench, screw locking pin plug (3) into hole (2) to cover locking pin (1) and tighten plug.
3.	Return breech operating lever (4) to latched position (TM-10).
4.	Close breech (TM-10).
	GO TO FRAME 6



11-5. CANNON TUBE INSTALLATION PROCEDURE (QUICK-CHANGE METHOD (CONT)

FRAME 6

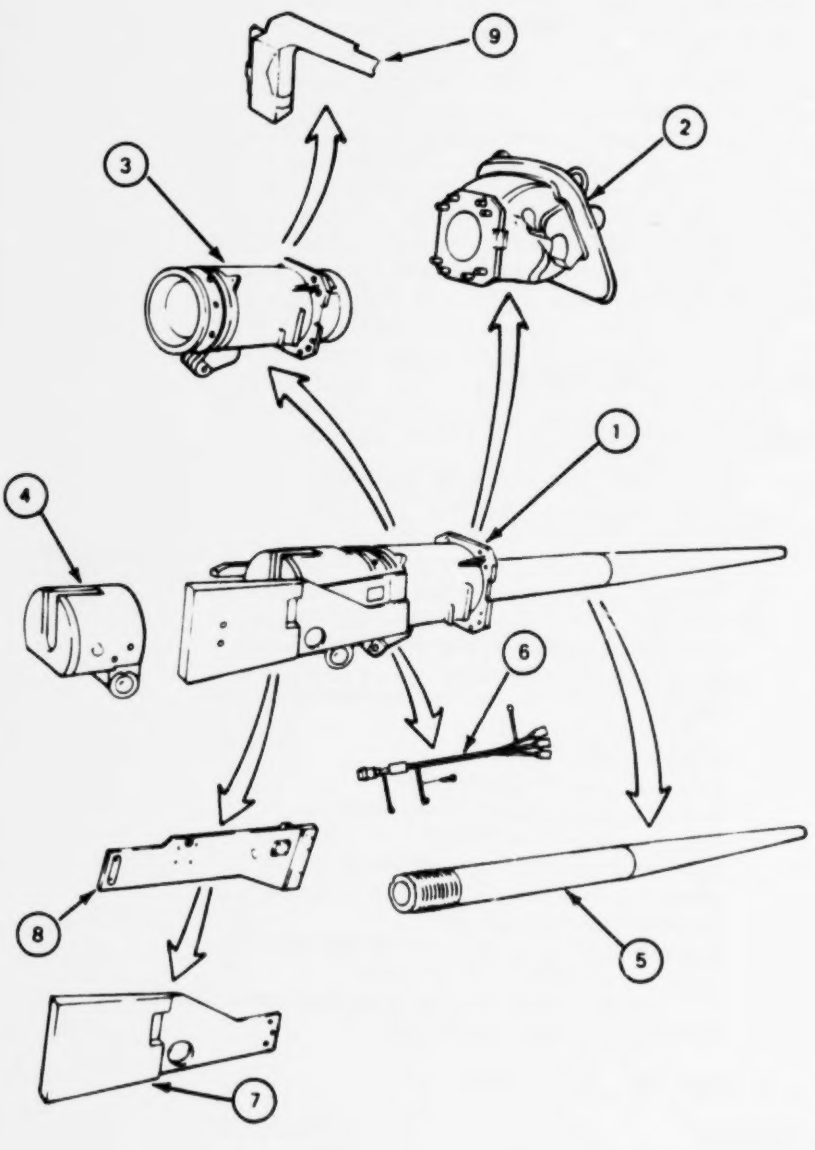
Step	Procedure
1.	Remove girth wrench (1) from cannon tube.
2.	Remove guide rope (2) from cannon tube.
3.	Remove hoist and sling (3) from cannon tube.
	NOTE Follow-on Maintenance Action Required: Install gun shield cover (TM-20-2-3). Install evacuator chamber (TM-10). Install loader's guard (TM-20-2-3).
	END OF TASK


HOIST

Section 3. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140

11-6. MAINTENANCE PROCEDURES INDEX

	Tasks						
Equipment Item	Inspection	Test	Removal	Installation	Disassembly	Assembly	Repair
1. Cannon Tube M68 and Combination Gun Mount M140			11-7	11-8	11-9	11-10	
2. Gun Shield			11-11	11-12			
3. Recoil Mechanism	11-13	11-14	11-15	11-16	11-17	11-18	11-19
4. Breech Ring			11-20	11-21	11-22	11-23	
5. Cannon Tube			11-20	11-21			
6. Electrical Firing Lead			11-24	11-25			
7. Gunner's Guard			11-26	11-27			
8. Gunner's Guard Support Bracket			11-28	11-29			
9. Torque Bracket			11-30	11-31			



11-7. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 REMOVAL PROCEDURE

TOOLS: Pry bar
Movable hoist (4 ton capacity minimum)
Sling (3 leg) (4 ton capacity minimum)
Chain hoist (NSN 3950-092-9064)
1-5/16" socket wrench (3/4" drive)
3/4" hinged handle
3/4" drive ratchet
2" extension (3/4" drive)
Wooden block (one) (fabricated tool, item 17, App. B)

SUPPLIES: Rope (30 feet long) 1/4" diameter)
Rope (8 feet long) (3/4" diameter)
Wooden blocks (12" x 12" x 36") (six)
6 foot step ladder

PERSONNEL: Five (including hoist operator)

REFERENCES: TM 9-2350-257-10 for procedures to:
- Traverse turret
- Elevate and depress cannon manually
- Remove evacuator chamber
- Remove 7.62-mm machine gun

TM 9-1240-285-34 for procedure to remove M114 telescope mount
TM 9-1220-220-34 for procedure to remove M10A5 ballistic drive
TM 9-2350-257-20-2-3 for procedures to:
- Remove machine gun mounting bracket
- Remove M105D telescope
- Remove M13A3 fire control elevation quadrant
- Remove loader's guard
- Remove gun shield cover
- Remove nylon ballistic shield
- Remove gun recoil replenisher hose
- Remove safety relay switch
- Remove breech closing mechanism
- Remove breech operating cam and spring
- Remove blasting machine
- Remove blasting machine mounting support
- Remove rate sensor and bracket
- Remove detent plunger and firing conductor assembly
- Remove elevating mechanism

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Control Box	FO-1	2
105-MM Gun	FO-3	6

11-7. CANNON TUBE M68 AND COMBINATION GUN MOUNT 140 REMOVAL PROCEDURE (CONT)

EQUIPMENT CONDITION:
Turret traversed until cannon is to side of vehicle (TM-10)
Cannon set to 0 degrees elevation (TM-10)
Driver's master control panel MASTER BATTERY switch set to OFF
Gunner's control box ELEV/TRAV POWER switch set to OFF
Turret traverse lock set to LOCKED
Evacuator chamber removed (TM-10)
Machine gun removed (TM-10)
Machine gun mounting bracket removed (TM-20-2-3)
M105D telescope removed (TM-20-2-3)
M114 telescope mount removed (TM-285-34)
M13A3 fire control elevation quadrant removed (TM-20-2-3)
Rate sensor and bracket removed (TM-20-2-3)
M10A5 ballistic drive removed (TM-220-34)
Loader's guard removed (TM-20-2-3)
Gun recoil replenisher hose removed (TM-20-2-3)
Loader's safety switch removed (TM-20-2-3)
Breech closing mechanism removed (TM-20-2-3)
Detent plunger and firing conductor assembly removed (TM-20-2-3)
Blasting machine removed (TM-20-2-3)
Blasting machine mounting support removed (TM-20-2-3)
Gun shield cover removed (TM-20-2-3)
Nylon ballistic shield removed (TM-20-2-3)
Breech operating cam and spring removed (TM-20-2-3)

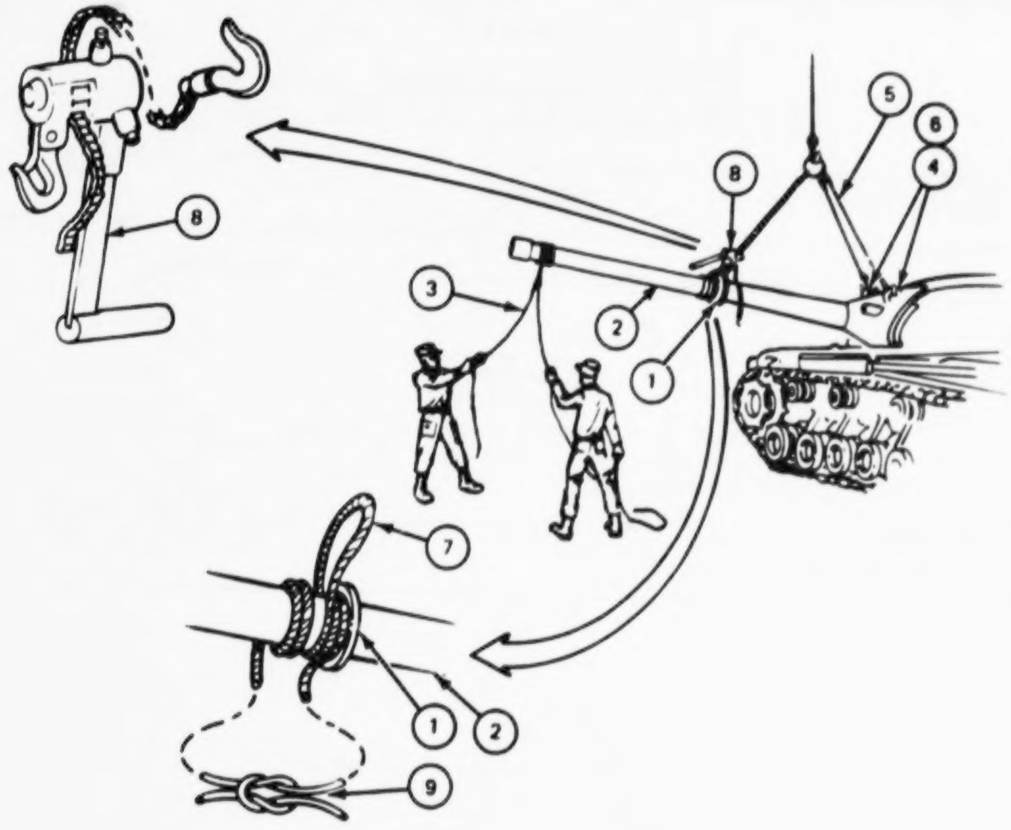
PRELIMINARY PROCEDURES:
Remove electrical firing lead (para 11-24)
Remove gun firing harness (para 4-3)
Remove gunner's guard (para 11-26)
Remove torque bracket (para 11-30)
Remove gunner's guard support bracket (para 11-28)

Para 11-7 Cont

11-7. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 REMOVAL PROCEDURE (CONT)

FRAME 1

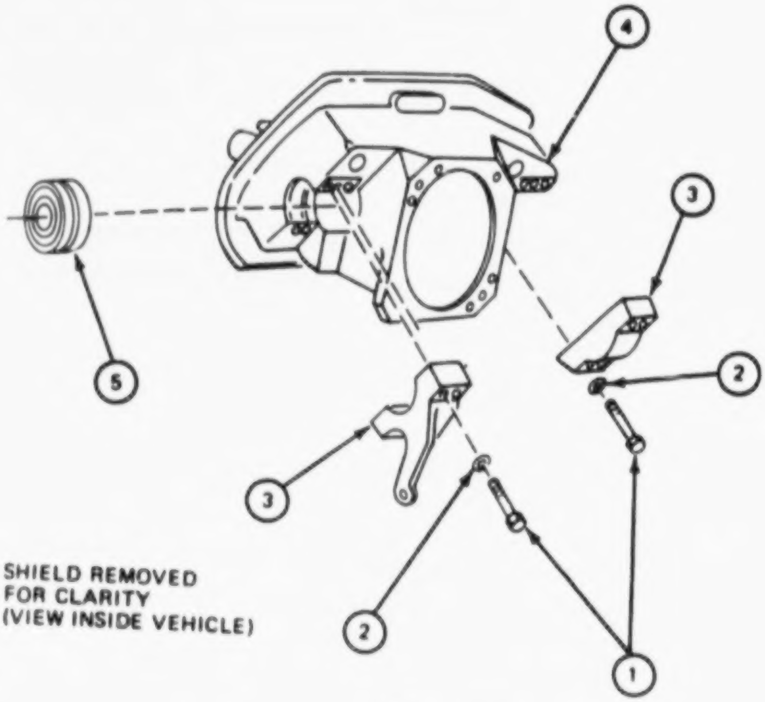
Step	Procedure
1.	Put bore evacuator retaining ring (1) on cannon tube (2).
	WARNING **Cannon tube (2) and gun mount weigh about four tons. Soldiers must stay out of way of tube and gun mount when they are lifted by hoist, to prevent injury.**
2.	Using 1/4" rope (3) at middle, wrap two half hitches around tube (2) at muzzle end.
	NOTE Soldier A: Operate hoist. Soldiers B and C: Pull rope (1) to steady and guide cannon tube as gun mount is moved out of turret. Soldier D: Operate chain hoist (8). Using step ladder, soldier D will raise and lower chain hoist to provide clearance for gun mount as it is moved out of turret. Soldier E: Inside turret, check gun mount clearance on all sides and tell outside soldiers when gun mount is clear to move.
3.	Put two hooks (4) of sling (5) into two eyelets on gun mount (6).
4.	Using hoist, raise hoist until slack is removed from sling (5).
	NOTE Rope (7) is wrapped around cannon tube (2) on muzzle side of evacuator retaining ring (1) to prevent slippage.
5.	Wrap 3/4" diameter rope (7) around cannon tube (2) five times. Pull up middle wrap of rope (7) to make loop.
6.	Put one hook of chain hoist (8) in third leg of sling (5) hook. Put second hook of chain hoist (8) in loop of rope (7). Take both ends of rope (7) and tie square knot (9).
7.	Turn handle of chain hoist (8) until all slack is removed from rope (7) and third leg of sling (5).
	GO TO FRAME 2



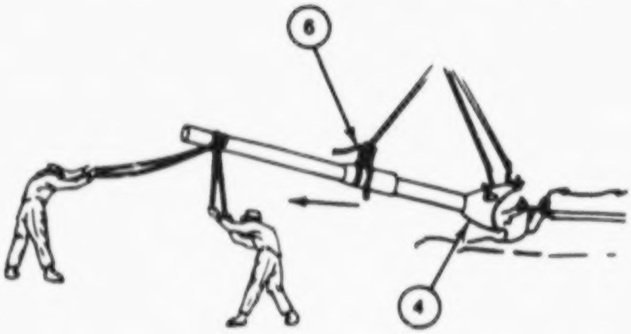
11-7. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Remove elevating mechanism (TM-20-2-3).
	NOTE When two trunnion bearing caps (3) are taken off, left side cap and shield has a thrust washer coined in place.
2.	Using socket wrench, remove eight screws (1) and eight lockwashers (2) holding two trunnion bearing caps (3) to gun mount (4).
3.	Using pry bar, if required, separate two trunnion bearing caps (3) from gun mount (4).
4.	Using hoist, raise gun mount (4) to clear trunnion bearings (5) in turret.
	CAUTION Chain hoist (6) is raised or lowered to give clearance to gun mount (4) on all sides as gun mount (4) is moved out of turret opening.
5.	Use chain hoist (6) to get clearance for gun mount (4) to move out of turret. GO TO FRAME 3



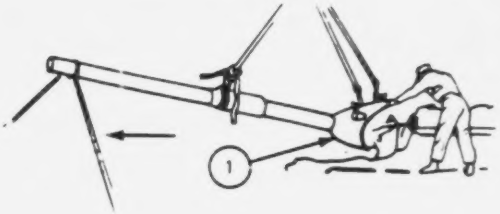
SHIELD REMOVED
FOR CLARITY
(VIEW INSIDE VEHICLE)

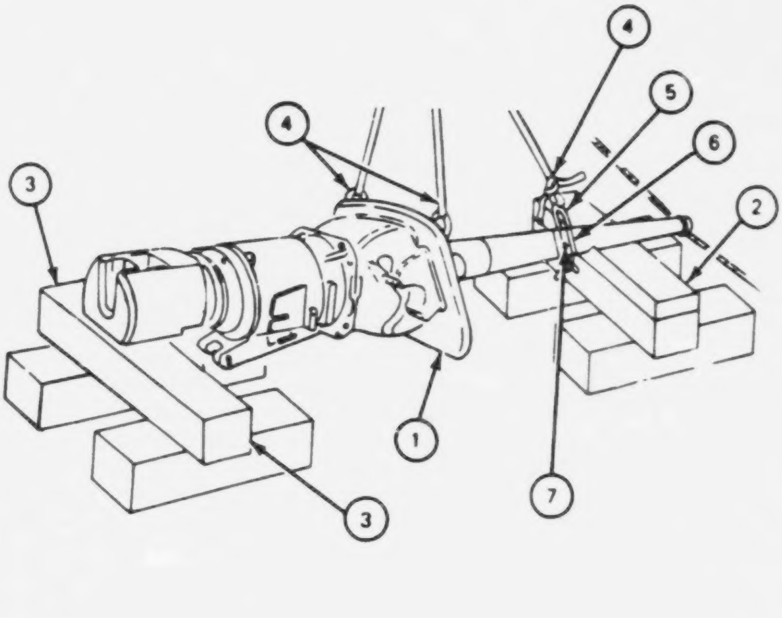


11-7. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 REMOVAL PROCEDURE (CONT)

FRAME 3

Step	Procedure
	NOTE Soldier A: Operate hoist. Soldiers B and C (one outside and one inside): Check clearance and guide gun mount (1).
1.	Using movable hoist, slowly and carefully move gun mount (1) out of turret opening.
2.	Using movable hoist, move gun mount (1) over wood blocks (2) and (3) on level ground.
	NOTE Soldier A: Operate hoist. Soldiers B, C, D and E: Guide gun mount (1), position wood blocks and remove sling hook (4).
3.	Using hoist, slowly lower gun mount (1) onto wood blocks (3) at breech end.
4.	Using chain hoist, slowly lower muzzle end of gun mount (1) and remove front sling hook (4), chain hoist (5), rope (6) and evacuator ring (7).
	NOTE Do step 5 only if gun shield is not going to be removed (para 11-11).
5.	Remove two sling hooks (4) from gun mount (1) and move hoist to clear area.
	END OF TASK


1



11-8. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 INSTALLATION PROCEDURE

TOOLS: Movable hoist (4 ton capacity minimum)
Sling (3 leg) (4 ton capacity minimum)
Chain hoist (NSN3950-092-9064)
1-5/16" socket (3/4" drive)
16" extension (3/4" drive)
3/4" drive ratchet
3/4" drive torque wrench (0 to 600 foot-pounds)
Torque multiplier

SUPPLIES: Rope (8 feet long) (3/4" diameter)
Rope (30 feet long) (1/4" diameter)
6 foot step ladder

PERSONNEL: Five (including hoist operator)

REFERENCES: TM 9-2350-257-10 for procedures to:
- Install evacuator chamber
- Install 7.62-mm machine gun

TM 9-1240-285-34 for procedures to:
- Install M114 telescope mount

TM 9-1220-220-34 for procedures to:
- Install M10A5 ballistic drive

TM 9-2350-257-20-2-3 for procedures to:
- Install machine gun mounting bracket
- Install M105D telescope
- Install M13A3 fire control elevation quadrant
- Install loader's guard
- Install gun shield cover
- Install nylon ballistic shield
- Install gun recoil replenisher hose
- Install loader's safety switch
- Install breech closing mechanism
- Install breech operating cam and spring
- Install blasting machine
- Install blasting machine mounting support
- Install rate sensor and bracket
- Install detent plunger and firing conductor assembly
- Install elevating mechanism

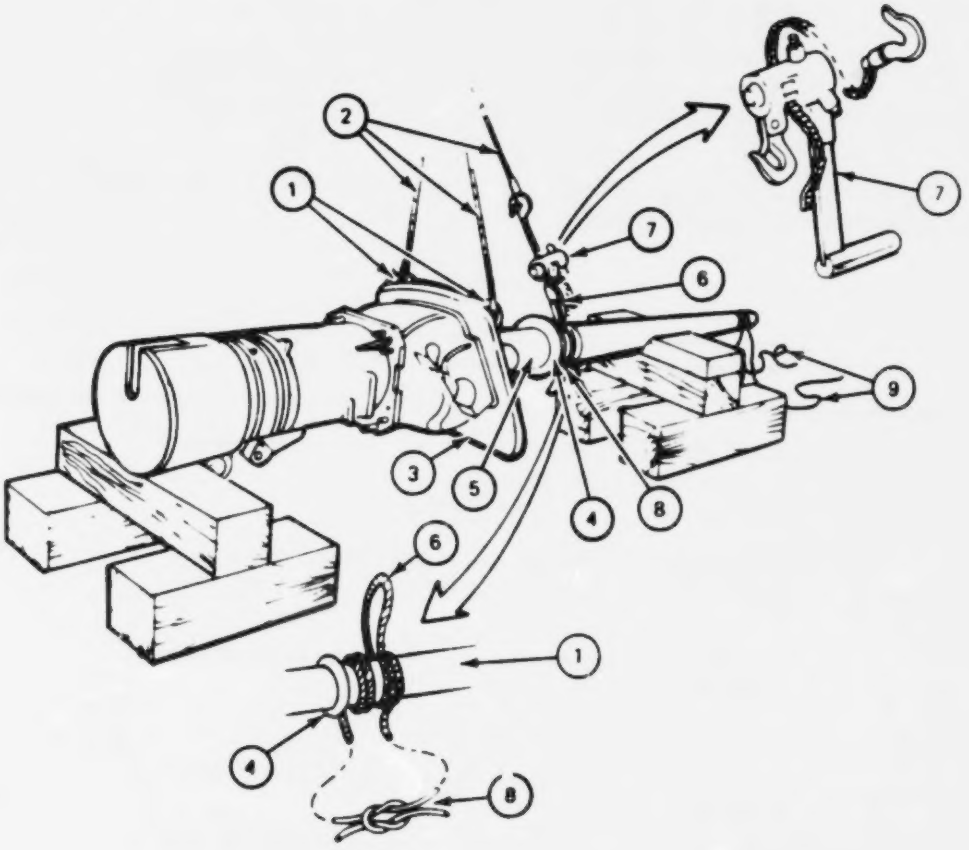
JPG for procedures to:
- Use torque wrench
- Use torque multiplier

PRELIMINARY PROCEDURES: Install cannon tube and breech ring (para 11-21)
Install recoil mechanism (para 11-16)
Install gun shield (para 11-12)

11-8. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 INSTALLATION PROCEDURE (CONT)

FRAME 1

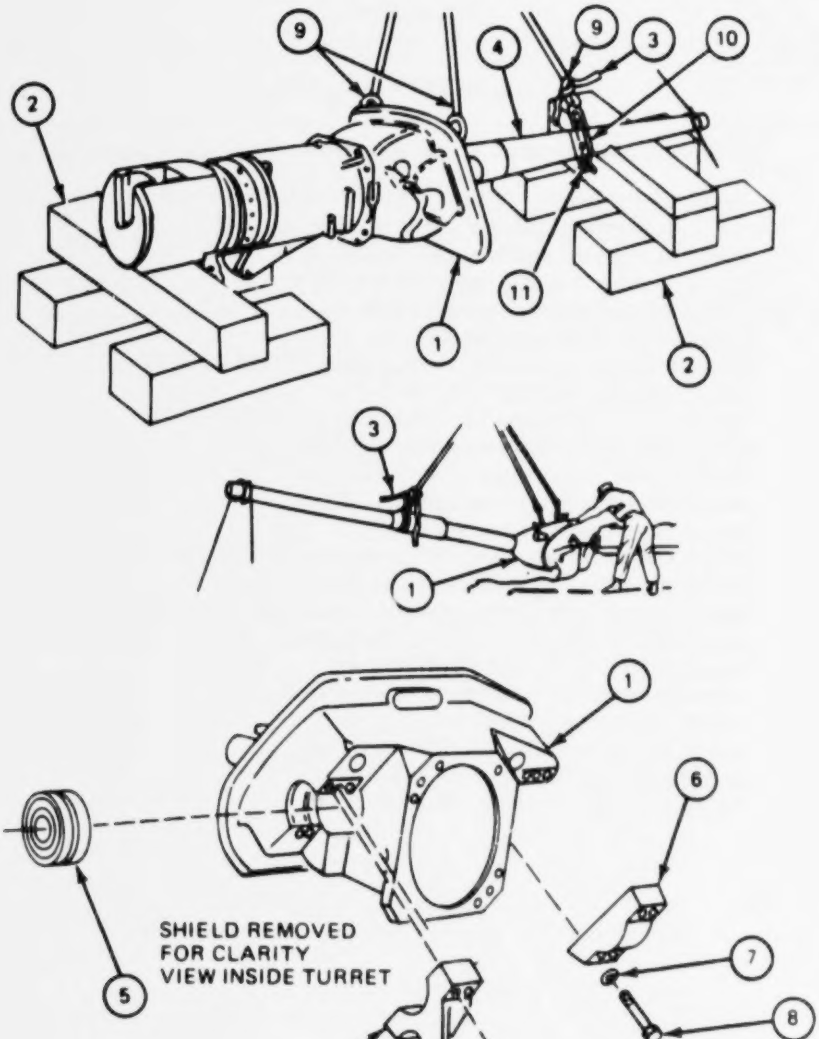
Step	Procedure
	WARNING Cannon tube and gun mount weigh about four tons. Stay out of way of tube and gun mount when they are lifted by hoist to prevent injury. **NOTE** Soldier A: Operate movable hoist. Soldier B and C: One on each side, hold guide rope at muzzle end, to prevent swinging and help to guide gun mount (3) into turret. Soldier D: Operate chain hoist for alignment and clearance to guide gun mount (3) into turret. Soldier E (inside turret): Check and tell soldier D how clearances are inside for gun mount (3) as it is moved into turret.
1.	Put two hooks (1) of hoist sling (2) in two eyelets on gun mount (3).
2.	Raise hoist sling (2) until slack is removed.
3.	Put bore evacuator retaining nut (4) in place on cannon tube (5) and lower load to wooden blocks.
	NOTE Wrap rope (6) around cannon tube (1) forward of the retaining nut to keep it from slipping.
4.	Wrap 3/4" rope (6) around cannon tube (5) five times. Pull up middle wrap of rope to make loop.
5.	Put one hook of chain hoist (7) in third leg of hoist sling (2) hook and put second hook of chain hoist in loop of rope (6). Pull both ends of rope tight and tie a square knot (8).
6.	Using guide rope (9) (at the middle) wrap two half hitches around cannon tube (5) at muzzle end.
7.	Work chain hoist (7) until all slack is removed from rope (6) and third leg of hoist sling (2). GO TO FRAME 2



11-8. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Soldier A: Operate movable hoist. Soldiers B and C: Guide gun mount (1). Soldier D: Operate chain hoist. Soldier E (inside turret): Check and tell Soldier D how clearances are for gun mount (1) as it is moved into turret.
1.	Using movable hoist, lift gun mount (1) off wooden blocks (2). Move gun mount (1) to position in front of turret opening.
	CAUTION Gun mount (1) must be lifted high enough to clear bearings (5) in turret, or bearings may be damaged.
2.	Using chain hoist (3) raise cannon tube (4) to about 45 degree angle on movable hoist.
3.	Using movable hoist, slowly move gun mount (1) into turret opening.
	CAUTION Use care when lowering shield onto trunnion bearings. Thrust washer will damage bearing if not properly seated. Two trunnion bearing caps (6) are not the same. Attach to gun mount (1) as shown.
	NOTE Left trunnion bearing cap (6) and shield has a thrust washer coined in place.
4.	Using movable hoist, lower gun mount (1) on trunnion bearings (5).
5.	Using socket wrench, attach two trunnion bearing caps (6) to gun mount (1) with eight lockwashers (7) and eight screws (8).
6.	Using torque wrench, extensions, and torque multiplier, tighten eight screws (8) to between 500 and 510 foot-pounds (JPG).
7.	Install elevating mechanism (TM-20-2-3).
8.	Remove three sling hooks (9), chain hoist (3), rope (10) and bore evacuator retaining ring (11).
	GO TO FRAME 3


9
4
9
3
10
2
11
1
2
3
1
1
6
5
7
8
6
7
8

SHIELD REMOVED
FOR CLARITY
VIEW INSIDE TURRET

11-8. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	NOTE Follow-on Maintenance Action Required: Install torque bracket (para 11-31). Install gunner's guard support bracket (para 11-29). Install rate sensor and bracket (TM-20-2-3). Install M105A ballistic drive (TM-220-34). Install gunner's guard (para 11-27). Install loader's guard (TM-20-2-3). Install blasting machine mounting support (TM-20-2-3). Install blasting machine (TM-20-2-3). Install breech operating cam and spring (TM-20-2-3). Install breech closing mechanism (TM-20-2-3). Install safety relay switch (TM-20-2-3). Install electrical firing lead (para 11-25). Install gun firing harness (para 4-3). Install detent plunger and firing conductor assembly (TM-20-2-3). Install gun recoil replenisher hose (TM-20-2-3). Install M13A3 fire control elevation quadrant (TM-20-2-3). Install M114 telescope mount (TM-285-34). Install M105D telescope (TM-20-2-3). Install machine gun mounting bracket (TM-20-2-3). Install machine gun (TM-10). Install evacuator chamber (TM-10). Install nylon ballistic shield (TM-20-2-3). Install gun shield cover (TM-20-2-3).
	END OF TASK

11-9. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 DISASSEMBLY PROCEDURE

PRELIMINARY PROCEDURES: Remove cannon tube M68 and combination gun mount M140 (para 11-7)

FRAME 1

Step	Procedure
1.	Remove gun shield (para 11-11).
2.	Remove recoil mechanism (para 11-15).
3.	Remove breech ring and cannon tube (para 11-20).
	END OF TASK

11-10. CANNON TUBE M68 AND COMBINATION GUN MOUNT M140 ASSEMBLY PROCEDURE

FRAME 1

Step	Procedure
1.	Install cannon tube and breech ring (para 11-21).
2.	Install recoil mechanism (para 11-16).
3.	Install gun shield (para 11-12).
	NOTE Follow-on Maintenance Action Required: Install cannon tube M68 and combination gun mount M140 (para 11-8).
	END OF TASK

11-11. GUN SHIELD REMOVAL PROCEDURE

TOOLS: Movable hoist (4 ton capacity)
Sling (2 leg) (4 ton capacity)
3/8" socket head screw key (Allen wrench)
2" extension (3/4" drive)
1-5/8" socket (3/4" drive)
Socket wrench handle (3/4" drive)
Pry bar

SUPPLIES: Rope (8 feet long) (3/4" diameter)
Wooden blocks (8" x 8" x 36") (two)

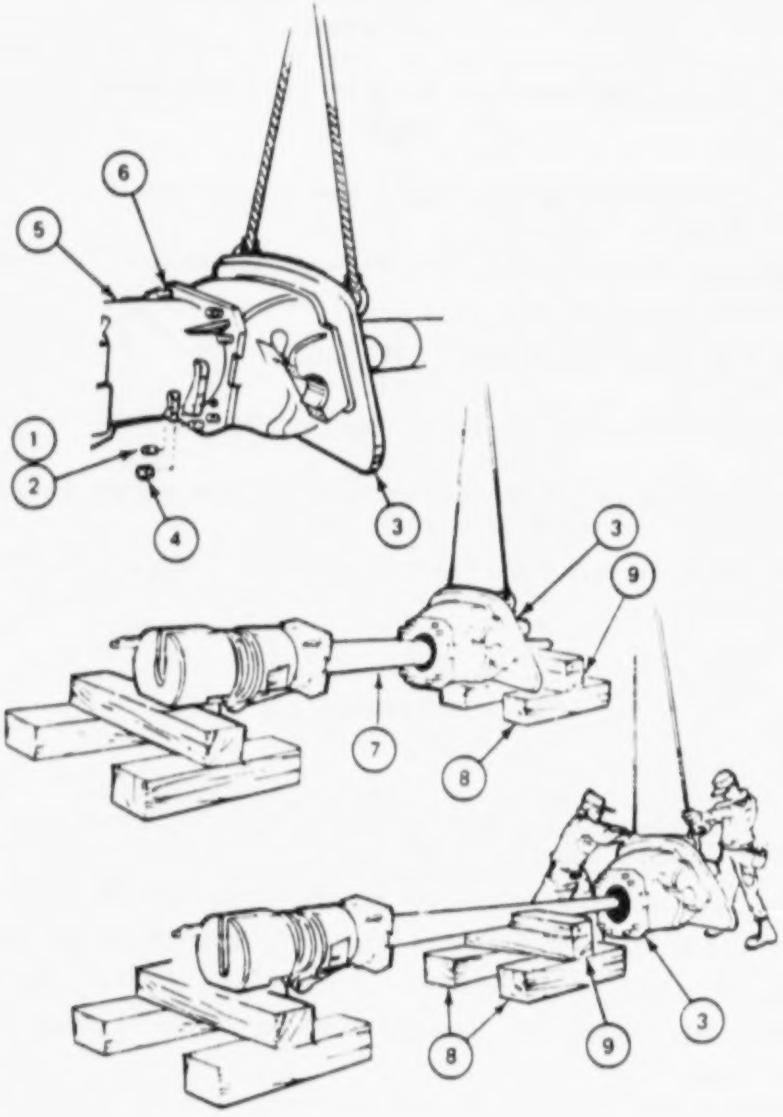
PERSONNEL: Three (including hoist operator)

PRELIMINARY PROCEDURES: Remove cannon tube M68 and combination gun mount M140 (para 11-7)

11-11. GUN SHIELD REMOVAL PROCEDURE (CONT)

FRAME 1

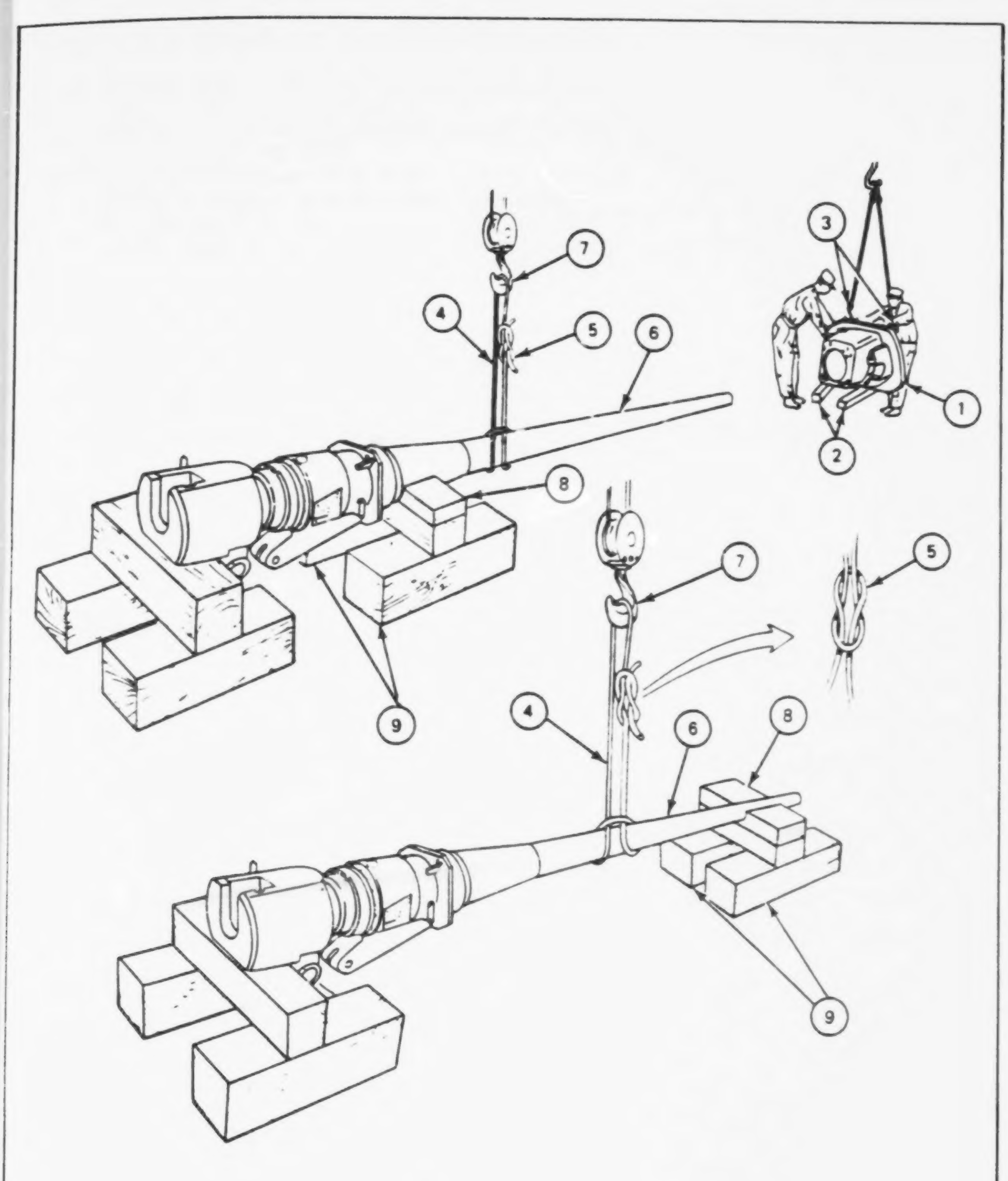
Step	Procedure
1.	Using Allen wrench, remove two pipe plugs (1) from two expandable dowel pins (2) one on each side of gun shield (3).
2.	Using socket wrench, remove eight nuts (4) holding gun shield (3) to recoil mechanism (5).
3.	Throw away eight nuts (4).
	CAUTION Use care in lifting to keep from damaging studs. Relieve weight on studs. Do not lift. Movable hoist and sling are still attached (para 11-7, frame 3).
4.	Soldier A: Using movable hoist, lift weight of gun shield (3) off eight studs (6).
	NOTE Use pry bar, if required, to loosen gun shield.
5.	Soldiers B and C: One on each side, push gun shield (3) off eight studs (6).
6.	Soldier A: Using movable hoist, raise gun shield (3) a little to clear cannon tube (7). Soldiers B and C: Guide gun shield and slide gun shield (3) along cannon tube to wooden blocks (8) and (9).
7.	Soldier A: Using movable hoist, lift gun shield (3) and cannon tube (7) off wooden blocks (8) and (9).
8.	Soldiers B and C: Move wooden blocks (8) and (9) on other side of gun shield (3).
9.	Soldier A: Using movable hoist, lower cannon tube (7) onto wooden blocks (8) and (9). Keep weight of gun shield (3) off cannon tube.
	WARNING Do not get feet or any part of body under gun shield (3) while gun shield is lifted in air or injury may result if gun shield should fall.
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide gun shield (3).
10.	Using hoist, slide gun shield off cannon tube (7). GO TO FRAME 2



11-11. GUN SHIELD REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Soldier A: Using movable hoist, move gun shield (1) to level ground.
	NOTE Wood blocking must support front and rear parts of shield.
2.	Soldiers B and C: Put two wooden blocks (2) under gun shield (1) as shown.
3.	Soldier A: Using hoist, lower gun shield (1) on wooden blocks (2).
4.	Soldiers B and C: Remove two sling hooks (3) from eyelets on gun shield (1) and remove sling.
5.	Soldier B and C: Using rope (4), tie ends together with a square knot (5) forming a rope loop.
6.	Soldiers B and C: Wrap rope loop (4) around cannon tube (6). Put one end of rope loop through other end of rope loop and pull tight.
7.	Soldiers B and C: Put rope loop (4) over hoist hook (7), take up slack and tighten square knot (5).
	WARNING Do not get feet or any part of body under cannon tube while cannon tube (6) is being lifted in air or injury may result if cannon tube should fall.
8.	Soldier A: Using hoist, raise cannon tube (6) off wooden block (8).
9.	Soldiers B and C: Move wooden blocks (8) and (9) to muzzle end of cannon tube (6).
10.	Soldier A: Using hoist, lower cannon tube (6) on wooden blocks (8) and (9).
11.	Soldiers B and C: Remove hoist hook (7) from rope (4) and rope from cannon tube (6)
	END OF TASK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Para 11-11 Cont

11-12. GUN SHIELD INSTALLATION PROCEDURE

TOOLS: Movable hoist (4 ton capacity)
Sling (2 leg) (4 ton capacity)
3/8" socket head screw key (Allen wrench)
1-5/8" socket (3/4" drive)
Socket wrench handle (3/4" drive)
3/4" drive torque wrench (0 to 600 foot-pounds)
2" extension (3/4" drive)
1-5/8" socket (1" drive)

SUPPLIES: Nuts (MS 21044-N18) (eight)
Crocus cloth (item 7, App. A)
Dry cleaning solvent (item 33, App. A)
Rags (item 21, App. A)
Grease (item 12, App. A)
Rope (8 feet long) (3/4" diameter)

PERSONNEL: Three (including hoist operator)

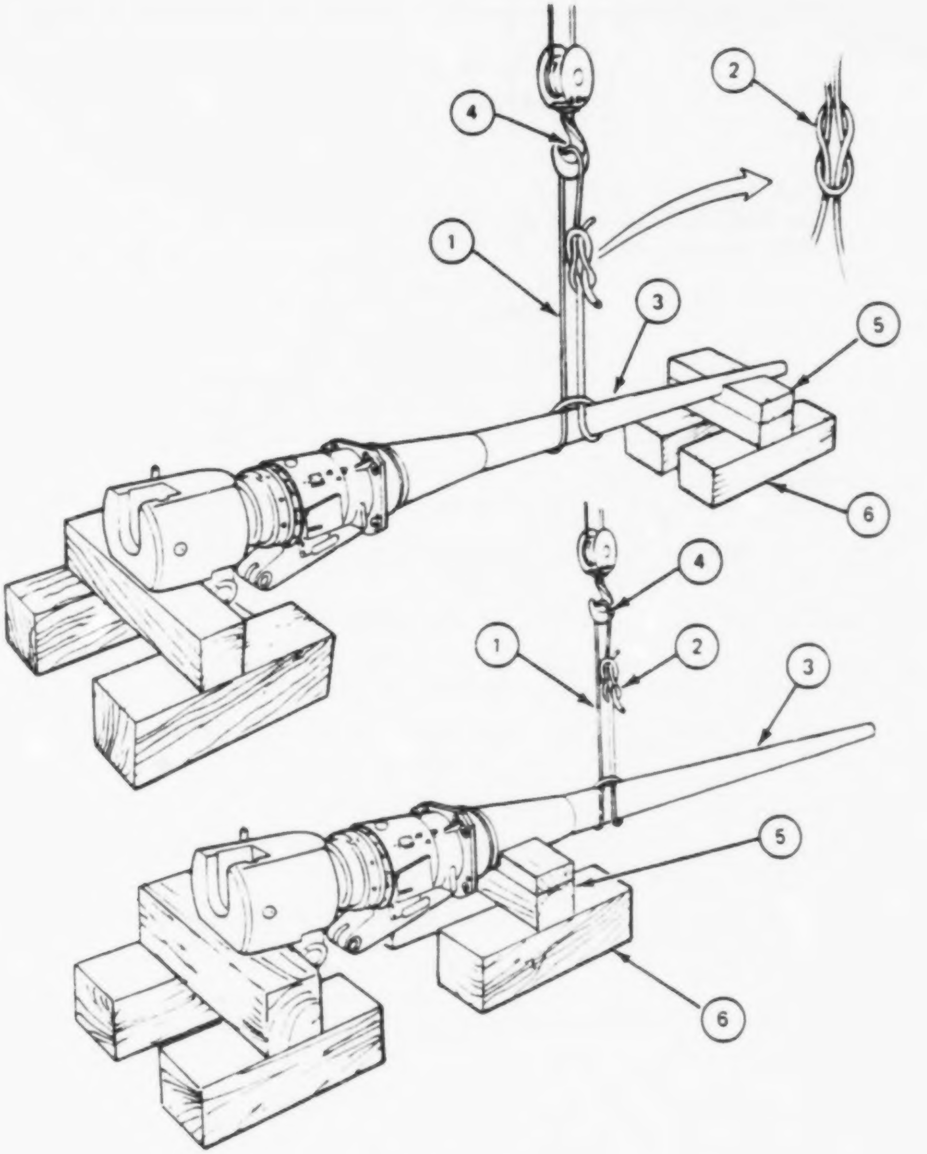
REFERENCES: JPG for procedures to:
Use torque wrench
Remove dirt and rust

PRELIMINARY PROCEDURES: Install recoil mechanism (para 11-16)

11-12. GUN SHIELD INSTALLATION PROCEDURE (CONT)

FRAME 1

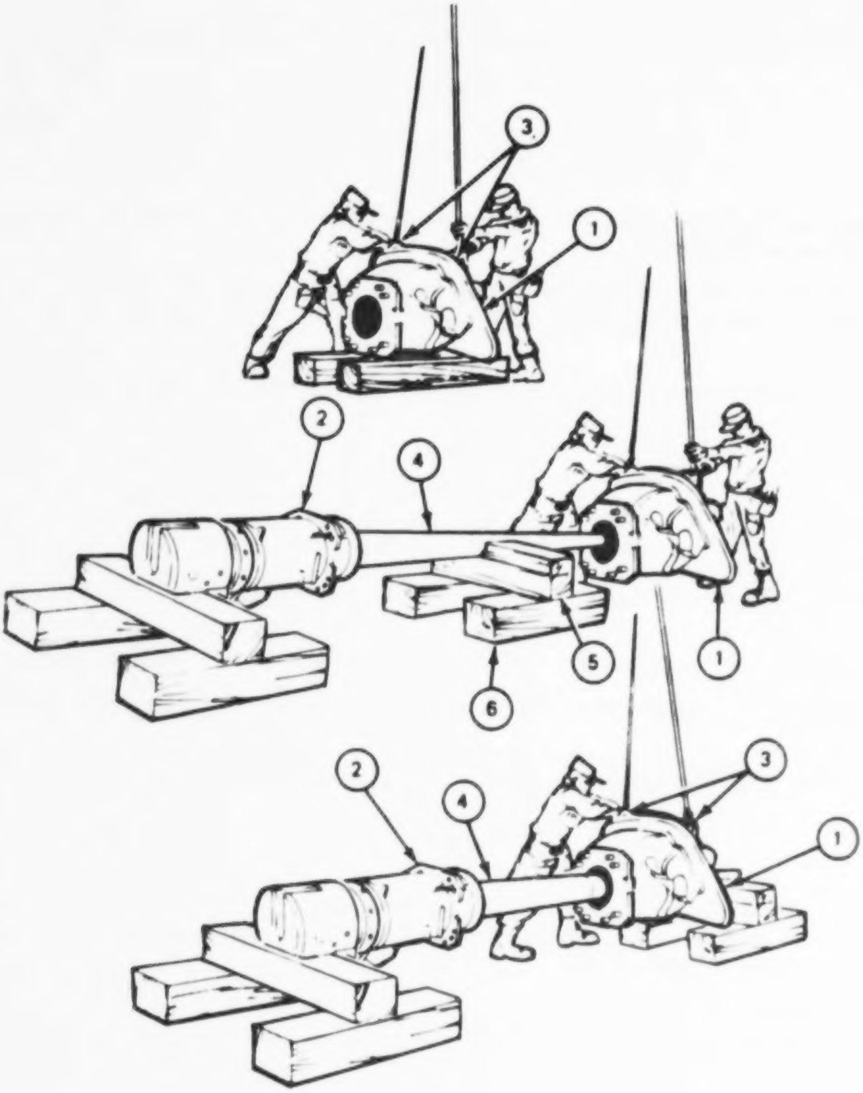
Step	Procedure
1.	Using rope (1) tie ends together with a square knot (2) forming a loop of rope.
2.	Using loop wrap one end of loop of rope (1) around cannon tube (3) and push other end of loop through first end.
	NOTE Soldier A: Operate hoist.
3.	Using hoist, put loop of rope (1) over hook (4) and take up slack to tighten square k (2).
	WARNING Do not get feet or any part of the body under cannon tube when cannon tube is being lifted in air. Injury may result if cannon tube should fall.
4.	Using hoist, raise cannon tube (3) off wooden blocks (5) and (6).
5.	Move wooden blocks (5) and (6) under cannon tube (3) on breech side of rope (1) near rope.
6.	Using hoist, lower cannon tube (3) on wooden blocks (5) and (6).
7.	Remove hoist hook (4) from rope (1).
8.	Remove rope (1) from cannon tube (3).
	GO TO FRAME 2



11-12. GUN SHIELD INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	WARNING Gun shield (1) weighs about 1-1/2 tons. Keep hands, feet and body from under gun shield when it is lifted by hoist to prevent injury if it should fall. **NOTE** Soldier A: Operate hoist. Soldiers B and C: Guide gun shield (1), check clearance between gun shield and cannon tube (4), and move wooden blocks (5) and (6).
1.	Using dry cleaning solvent, rags and crocus cloth, remove any dirt, rust, or rust preventive compound from machined surfaces before installing gun shield (1) (JPG).
2.	Using rag, spread a small amount of grease on inside of gun shield (1) and recoil mechanism (2) machined surfaces.
3.	Put hoist sling hooks (3) into two eyelets on gun shield (1).
4.	Using movable hoist, lift and move gun shield (1) along cannon tube (4) until gun shield is next to wooden blocks (5) and (6) (rear of shield).
5.	Using hoist, carefully lift gun shield (1) until cannon tube (4) is off wooden blocks (5) and (6).
6.	Move wooden blocks (5) and (6) to front side of gun shield (1).
7.	Using hoist, lower gun shield (1) until cannon tube (4) rests on wooden blocks (5) and (6).
8.	Using hoist, move weight of gun shield (1) off cannon tube (4) until there is clearance between them. GO TO FRAME 3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1
6
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4
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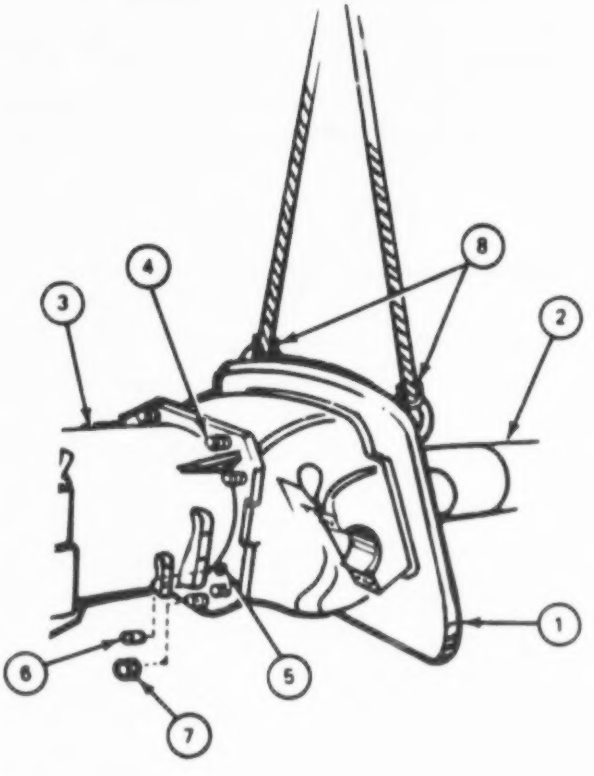
1

11-12. GUN SHIELD INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide gun shield.
1.	Using movable hoist, carefully move gun shield (1) over cannon tube (2) until it is against recoil mechanism (3).
2.	Soldiers B and C: Line up eight studs (4) and two dowel pins (5) with holes in reco mechanism (3) and carefully push studs, dowel pins and gun shield (1) as far as they will go.
3.	Using Allen wrench, put two pipe plugs (6) into two dowel pins (5) in gun shield (1
	NOTE Nuts (7) are self-locking type and must be replaced with new ones each time they are removed.
4.	Using socket wrench, attach recoil mechanism (3) to gun shield (1) with eight new nu (7).
5.	Using torque wrench, torque eight nuts (7) to between 600 and 610 foot-pounds (JPC
6.	Using Allen wrench, tighten two pipe plugs (6) into two dowel pins (5) in gun shield (1).
7.	Remove hoist sling hooks (8) from two eyelets on gun shield (1).
	NOTE Follow-on Maintenance Action Required: Install cannon tube M68 and combination gun mount M140 (para 11-8).
	END OF TASK



11-13. RECOIL MECHANISM INSPECTION PROCEDURE

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble recoil mechanism (para 11-17)

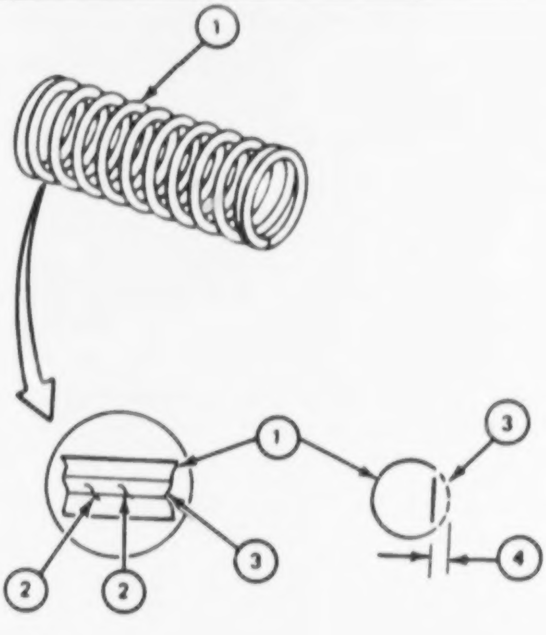
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

FRAME 1

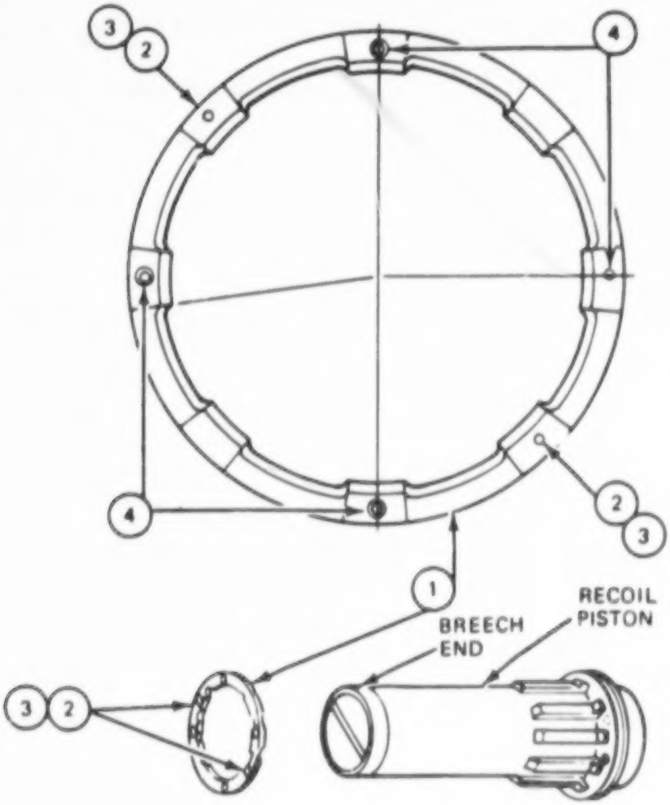
Step	Procedure
	NOTE Cracks (2) within worn area (3) of recoil spring (1) are normal.
1.	Replace recoil spring (1) if cracks (2) extend outside worn area (3).
2.	Replace recoil spring (1) if depth (4) of worn area (3) is greater than 0.020".
	GO TO FRAME 2



11-13. RECOIL MECHANISM INSPECTION PROCEDURE (CONT)

FRAME 2

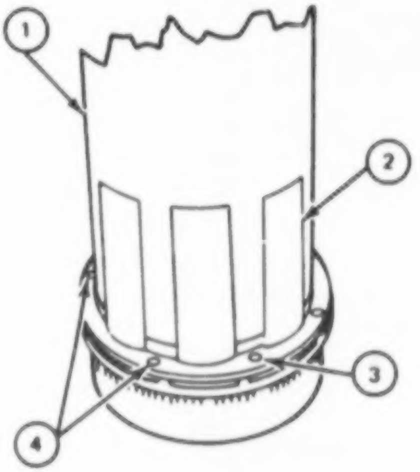
Step	Procedure
	NOTE If spring recoil ring (1) does not have two dowel pins (2), mandatory modification must be done to add them.
1.	Check spring recoil ring (1). If it does not have two dowel pins (2) and dowel pin holes (3) in addition to four existing screw holes (4), do para 11-19b. GO TO FRAME 3



11-13. RECOIL MECHANISM INSPECTION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	NOTE If piston (1) part number is 8449037, piston is of new design and does not require modification by machining. If piston (1) part number is 11658913, piston has been modified. If piston (1) part number is 10915951, piston must be modified.
1.	Check part number of piston (1) located in (one of eight) splines (2). If piston part number is 10915951, do para 11-19a.
	NOTE If two dowel pin holes (3) do not exist, they must be added.
2.	Check head of piston (1). If it does not have two dowel pin holes (3) in addition to four existing screw holes (4), do para 11-19b. GO TO FRAME 4

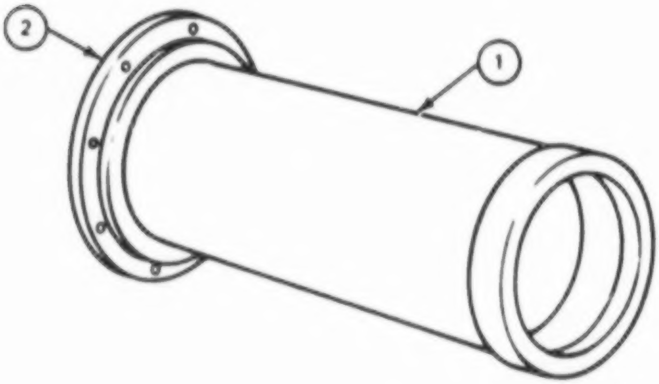


NOTE
A DOWEL PIN HOLE IS HIDDEN FROM VIEW 180° OPPOSITE DOWEL PIN (3) SHOWN.

11-13. RECOIL MECHANISM INSPECTION PROCEDURE (CONT)

FRAME 4

Step	Procedure
	NOTE If sleeve (1) part number is 8449036, sleeve is of new design and does not require modification by machining. If sleeve (1) part number is 11658912A, sleeve has been modified. If sleeve (1) part number is 8762794, sleeve must be modified. If sleeve (1) part number is 11658912, dimensions of rear bearing surfaces must be checked.
1.	Check part number of sleeve (1) located on upper face of flange (2).
2.	If sleeve (1) part number is 8762794, do para 11-19c.
3.	If sleeve (1) part number is 11658912, do para 11-19d.
	GO TO FRAME 5



11-13. RECOIL MECHANISM INSPECTION PROCEDURE (CONT)

FRAME 5

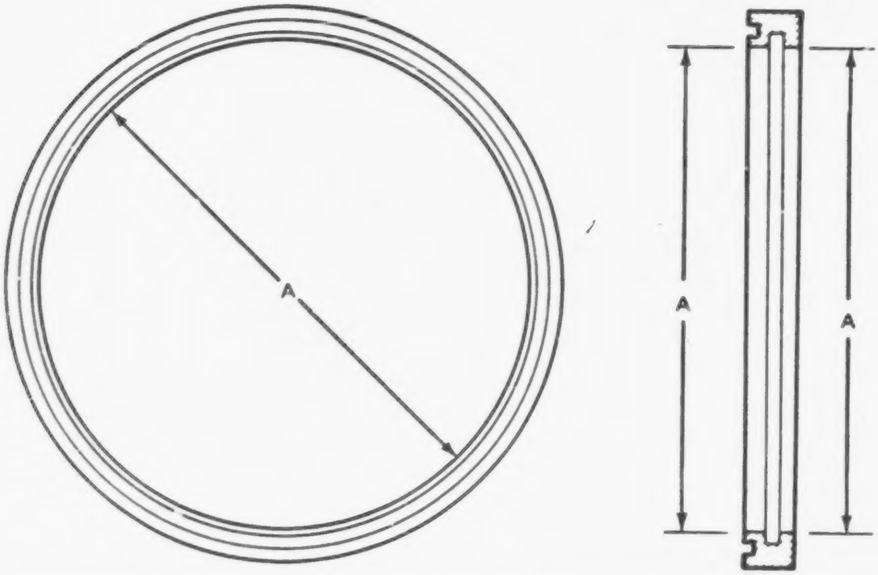
Step	Procedure
	SUPPORT SHOP WORK
1.	Take outer seal retainer to shop where inspection equipment is available.
2.	Make dimensional check

Reference Letter	Point of Measurement	Measurement
A	ID	11.505 to 11.511

NOTE

Tag retainer if it is out of tolerance.

Step	Procedure
3.	After support shop work, return outer seal retainer to turret shop.
	END OF TASK



11-14. RECOIL MECHANISM TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Recoil mechanism test fixture (NSN 4933-00-830-5637)
Hydraulic pressure gauge (0 to 5,000 psi)
Suitable hydraulic fittings, preformed packings, and tools
Watch with sweep second hand

TOOLS: 1/2" combination wrench
Machinist steel rule (12" long)
O-ring extractor kit

SUPPLIES: Hydraulic fluid (8 gallons) (item 10, App. A)
Rags (item 21, App. A)
Container (2 quart minimum)
Oil drip pan
Funnel

PERSONNEL: Two

REFERENCES: JPG for procedures to:
Use M3 oil pump
Install preformed packing

PRELIMINARY PROCEDURES: Install recoil mechanism (para 11-16)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

NOTE

Use rags for fluid spillage.

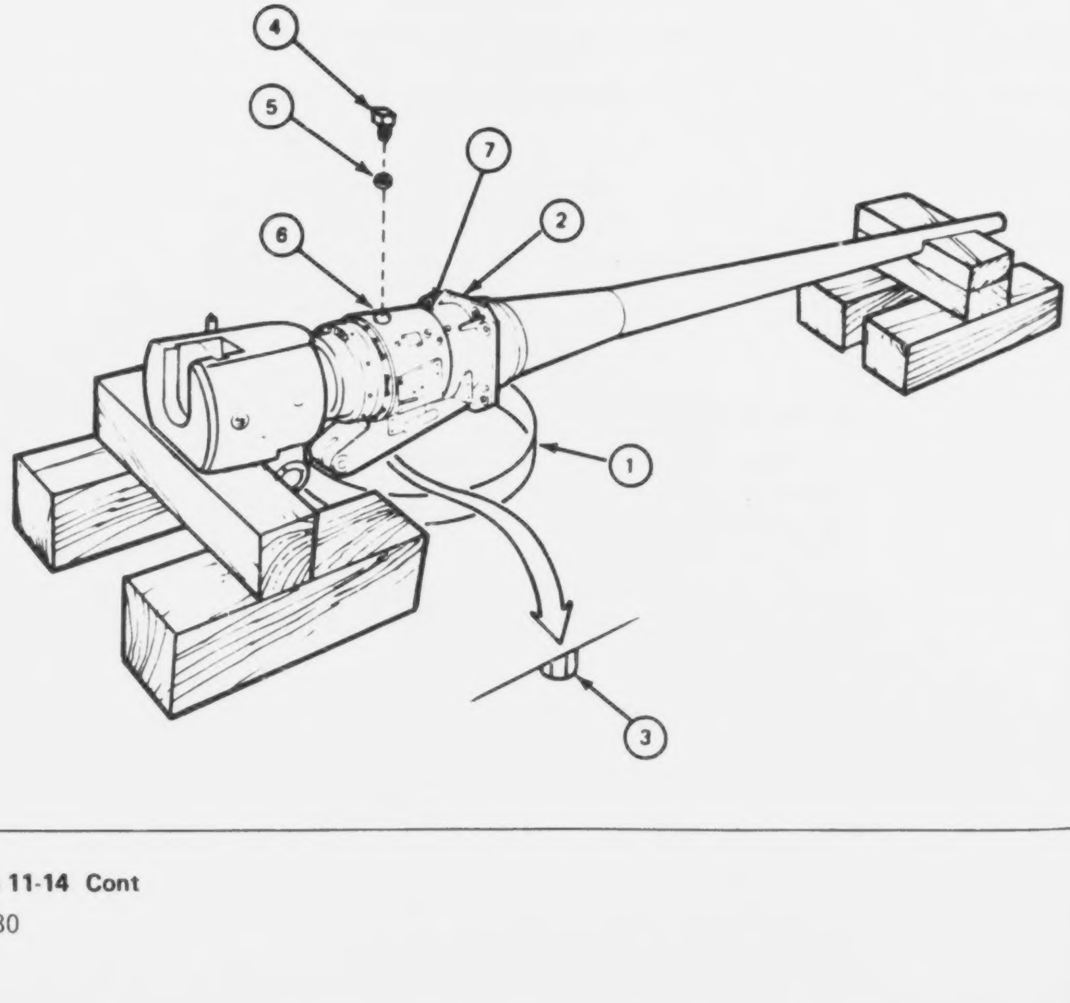
If normal indication is not obtained remove and disassemble recoil mechanism (para 11-15 and 11-17). Refer to section index (para 11-6) for replacement of bad part.

Suitable hydraulic fittings, preformed packings, and tools should be used to connect test equipment to parts being tested.

11-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

FRAME 1

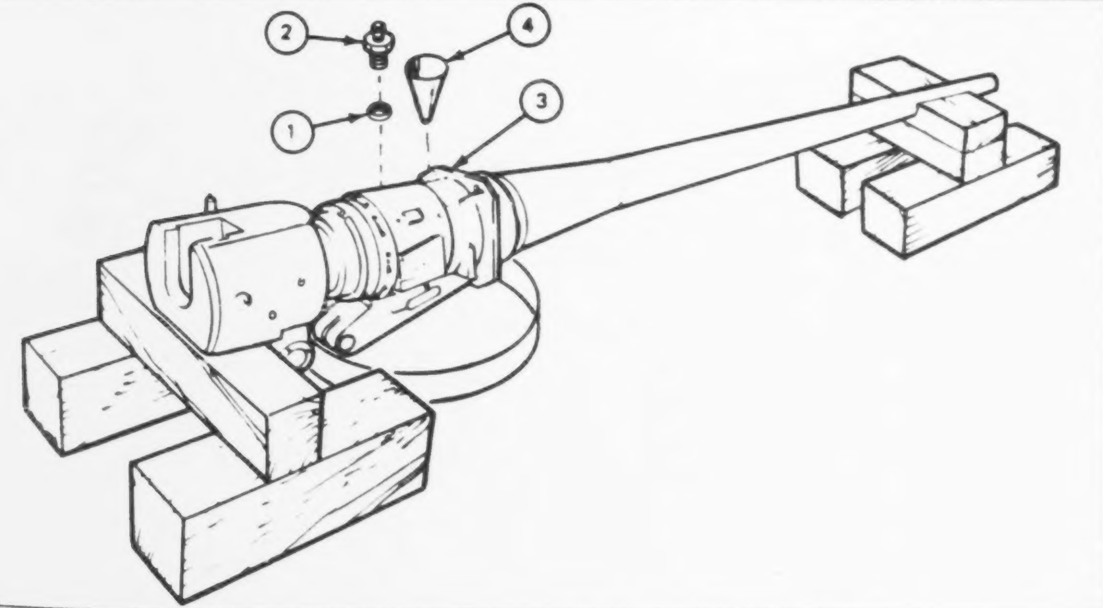
Step	Procedure
	NOTE Make sure gun and mount are on wooden blocks at least 24" high. Recoil mechanism must be level.
1.	Put oil drip pan (1) under recoil mechanism (2).
2.	Using 1/2" wrench, tighten drain plug (3) on bottom of recoil mechanism (2).
3.	Using 1/2" wrench, remove plug (4) and washer (5) from hole (6) on top of recoil mechanism (2).
4.	Remove protective plug or tape from hole (7) on top of recoil mechanism (2). GO TO FRAME 2



1-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

RAME 2

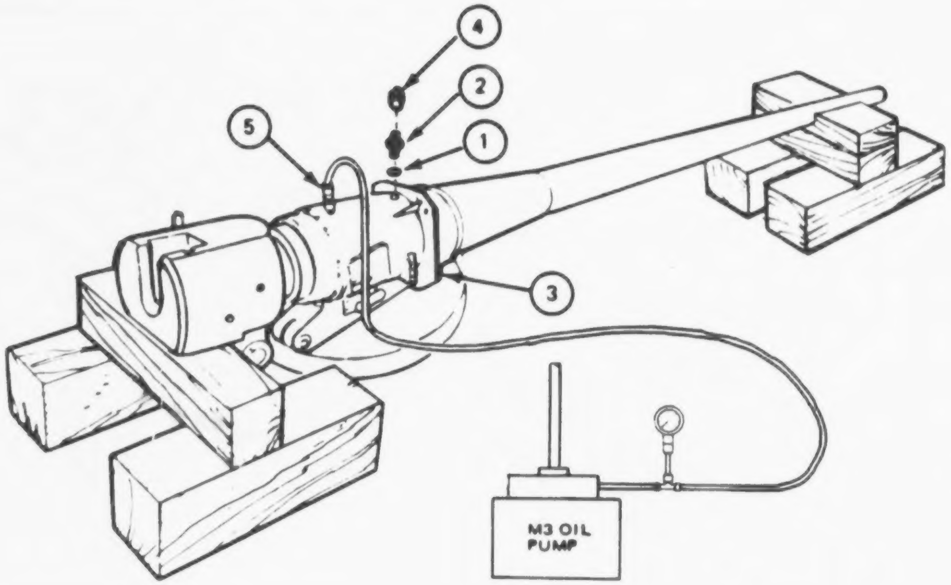
Step	Procedure
1.	Lightly coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on reducer (2) (JPG).
3.	Put reducer (2) in hole on top of recoil mechanism (3).
	NOTE Funnel (4) may need to be held slightly above hole so hydraulic fluid will flow freely. Recoil mechanism (3) holds about 4 gallons of hydraulic fluid.
4.	Put funnel (4) in hole on top of recoil mechanism (3).
5.	Using container of clean hydraulic fluid, slowly pour hydraulic fluid through funnel (4) into recoil mechanism (3).
6.	Fill recoil mechanism (3) until hydraulic fluid free of air bubbles flows from reducer (2).
7.	Stop pouring hydraulic fluid and allow recoil mechanism (3) to set.
8.	Using watch, wait 5 minutes and then repeat step 5 and 6.
9.	Remove funnel (4).
	GO TO FRAME 3



11-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

FRAME 3

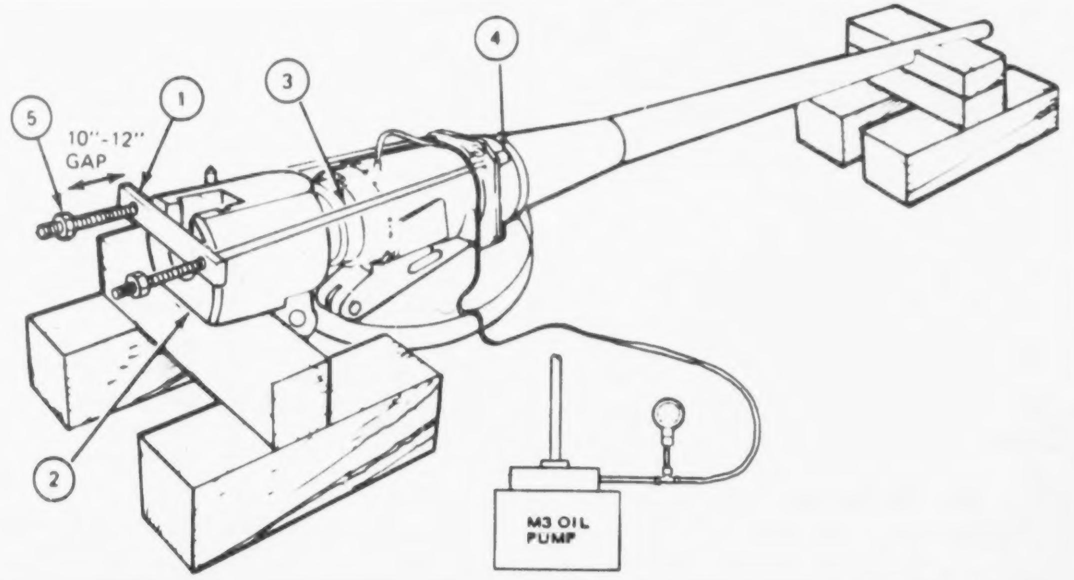
Step	Procedure
1.	Lightly coat preformed packing (1) with hydraulic fluid.
2.	Using O-ring extractor tool, put preformed packing (1) on adapter (2) (JPG).
3.	Put adapter (2) in hole on top of recoil mechanism (3).
4.	Using hands, put pressure cap (4) on adapter (2).
5.	Assemble M3 oil pump with 5000 psi gauge as shown.
6.	Connect hose from M3 oil pump to reducer (5) on recoil mechanism (3).
	NOTE Soldier A: Operate M3 oil pump. Soldier B: Open pressure cap to remove air from recoil mechanism.
7.	Using M3 oil pump, raise pressure in recoil mechanism (3) to between 100 and 200 psi (JPG).
8.	Loosen and tighten pressure cap (4) until hydraulic fluid is free of air bubbles.
9.	Using M3 oil pump, reduce pressure to 0 psi (JPG).
	GO TO FRAME 4



11-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

FRAME 4

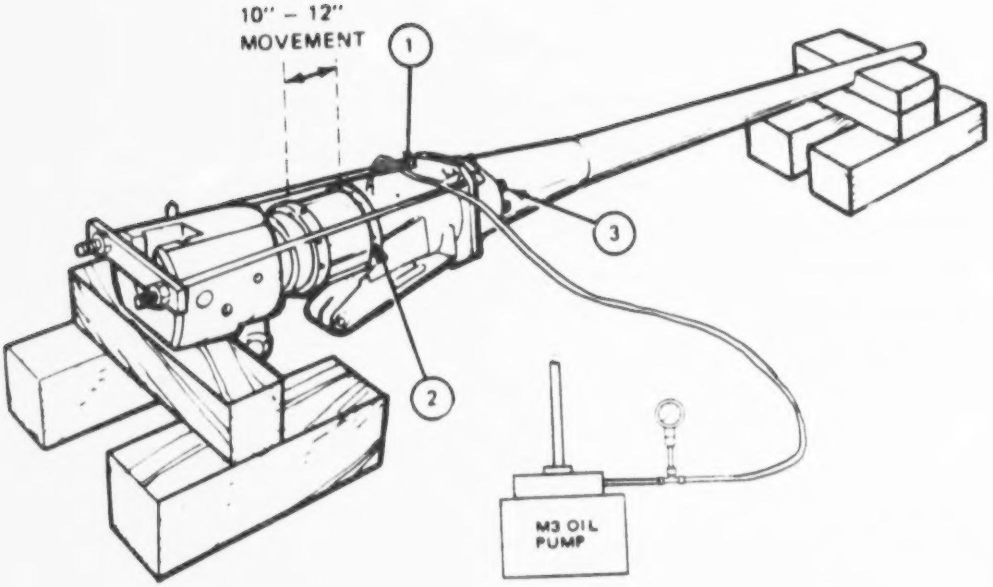
Step	Procedure
	NOTE Two Soldiers are needed to put test fixture in position. Soldier A holds block in place while soldier B puts in rods and nuts.
1.	Hold block (1) of test fixture against end of breech (2).
2.	Push threaded end of two rods (3) of test fixture through holes (4) in flange from muzzle end of recoil mechanism.
3.	Put two rods (3) through block (1).
	NOTE Block must be held against breech ring and rods pushed fully in place (rearward).
4.	Using steel rule, put two nuts (5) equally on rods (3) so distance from front face of block (1) to nuts is between 10" and 12"
5.	Using rags, wipe all hydraulic fluid from outside of recoil mechanism for leak check.
	GO TO FRAME 5



11-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

FRAME 5

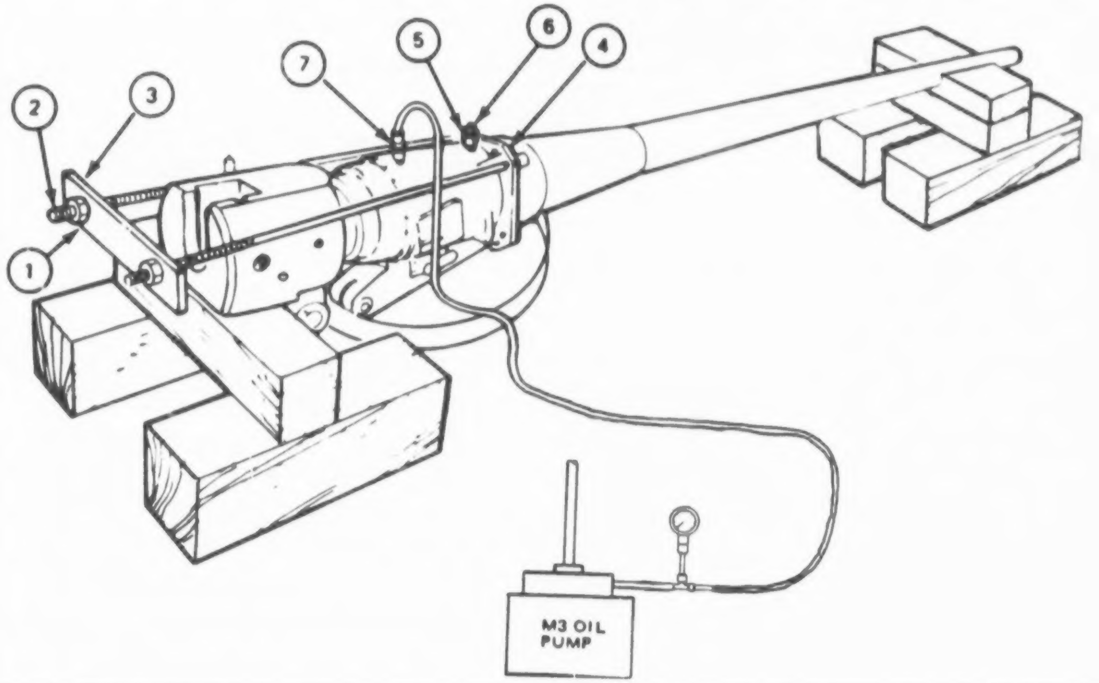
Step	Procedure	Normal Indication	Probable Fault
1.	Using M3 oil pump slowly pressurize recoil mechanism (1) (JPG).	. . .	. . .
2.	Check all test connections for leaks. Repair as required.	. . .	. . .
3.	Using M3 oil pump, continue to increase pressure in recoil mechanism (1) to between 300 and 400 psi (JPG).	A. 300 to 400 psi on pressure gauge.	A. Leakage
		B. Recoil mechanism should start moving.	B. Obstruction blocking movements
4.	Using M3 oil pump, continue to increase pressure in recoil mechanism (1) to between 2450 and 2550 psi (JPG).	A. Steady 2450 to 2550 psi on pressure gauge.	A. Air in recoil mechanism (Repeat air removal, frame 3) Leakage
		B. Recoil mechanism should move 10" to 12" (Maximum allowed by block of test fixture)	B. Bad recoil mechanism
5.	Using watch, hold pressure for 5 minutes. Check for leaks at rear spring seat (2) and support sleeve (3).	A. Steady 2450 to 2550 psi on pressure gauge	A. Leakage
		B. No leakage	B. Bad sleeve, internal seals, or seal retainer.
6.	Using M3 oil pump, reduce pressure to 0 psi (JPG).	A. 0 psi on pressure gauge	A. Hydraulic fluid blocked.
		B. Recoil mechanism should move to breech end (original position)	B. Bad recoil mechanism or obstruction blocking movement.
	GO TO FRAME 6		


10" – 12"
MOVEMENT
1
3
2
M3 OIL
PUMP

11-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

FRAME 6

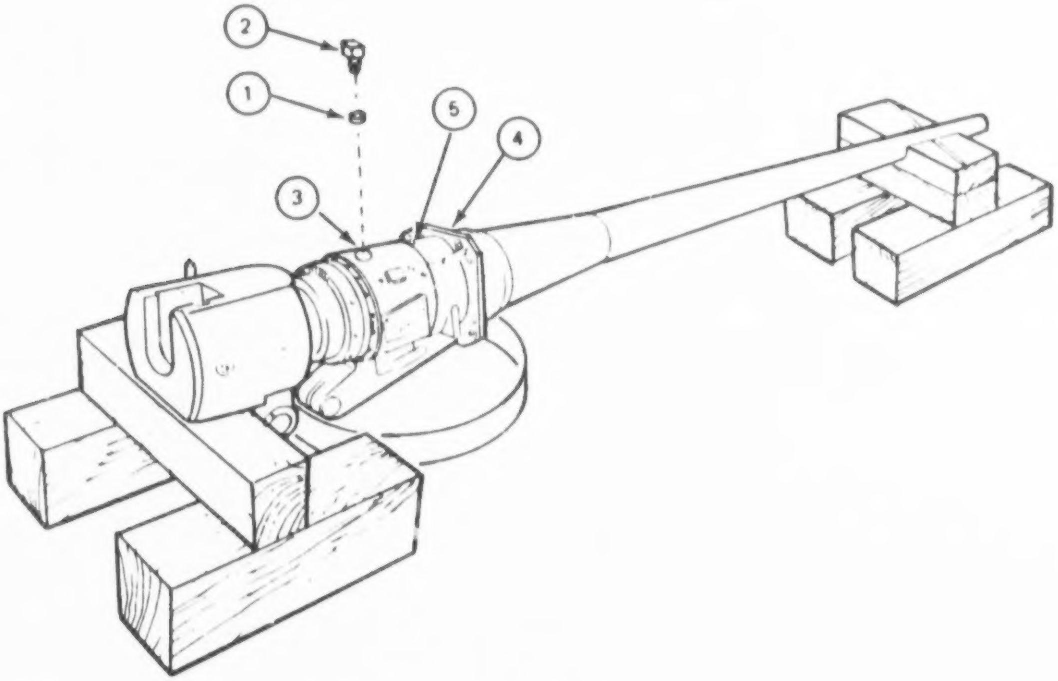
Step	Procedure
	NOTE If normal indication was obtained in Frame 5, recoil mechanism is good. Two soldiers are needed to remove test fixture. Soldier A holds block while soldier B removes nuts and rods.
1.	Using hands, remove two nuts (1) from two rods (2) of test fixture.
2.	Remove block (3) from two rods (2).
3.	Carefully remove two rods (2) from recoil mechanism (4).
4.	Remove pressure cap (5) and adapter (6) from top of recoil mechanism (4).
5.	Remove hose of M3 oil pump from reducer (7).
6.	Remove reducer (7) from top of recoil mechanism (4).
7.	Disassemble M3 oil pump.
	GO TO FRAME 7



11-14. RECOIL MECHANISM TEST PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Using 1/2" wrench, put new washer (1) and plug (2) in hole (3) on top of recoil mechanism (4).
2.	Put protective plug or tape in hole (5) on top of recoil mechanism (4).
3.	Using rags, wipe up all hydraulic fluid spills from recoil mechanism (4).
	NOTE Follow-on Maintenance Action Required: Install gun shield (para 11-12).
	END OF TASK



11-15. RECOIL MECHANISM REMOVAL PROCEDURE

TOOLS: 1/2" open end wrench
Movable hoist (4 ton capacity)
5/16" socket head screw key (Allen wrench)
Spanner wrench (NSN 5120-00-986-3129)

SUPPLIES: Funnel
Can (6 gallon capacity)
Rope (20 feet long) (3/4" diameter)
Wood blocks 12" x 12" x 36" (two)
Rags (item 21, App. A)

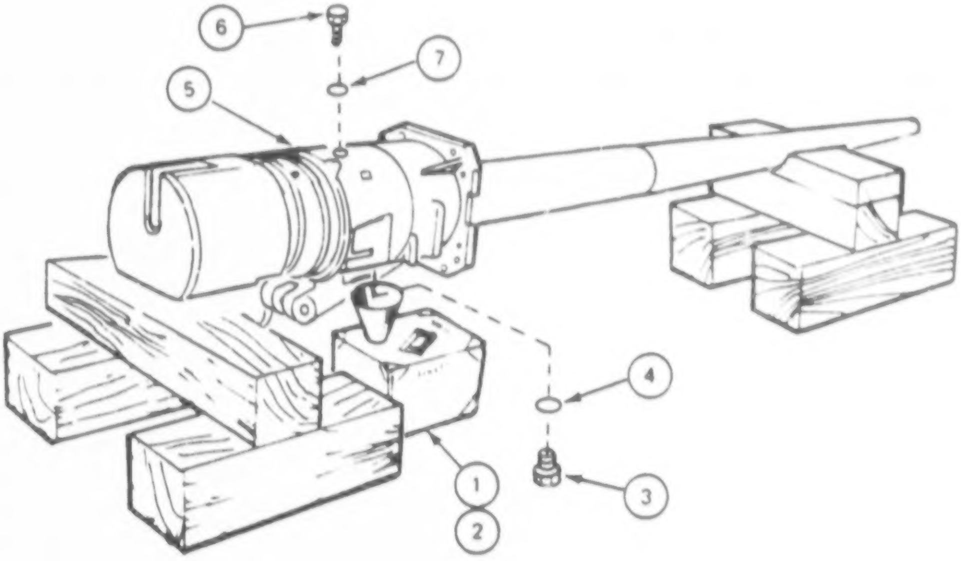
PERSONNEL: Three (including hoist operator)

PRELIMINARY PROCEDURES: Remove gun shield (para 11-11)

11-15. RECOIL MECHANISM REMOVAL PROCEDURE (CONT)

FRAME 1

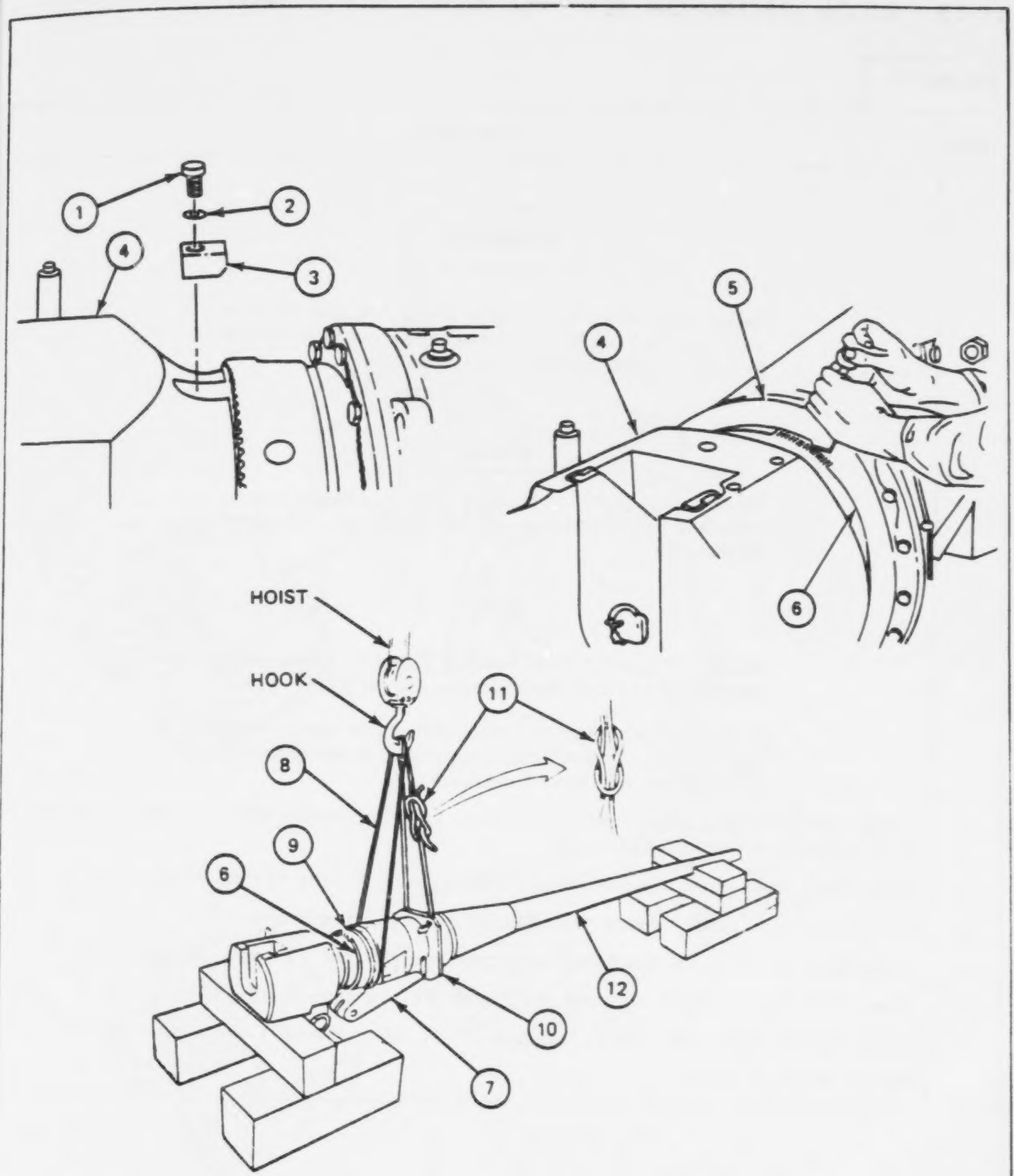
Step	Procedure
	NOTE If recoil mechanism will be disassembled, do steps 1 thru 6. If recoil mechanism will not be disassembled, GO TO FRAME 2.
1.	Put can (1) and funnel (2) under plug (3).
2.	Using open end wrench, remove plug (3) and washer (4) from recoil mechanism (5).
3.	Using open end wrench, remove plug (6) and washer (7) from recoil mechanism (5).
4.	Let oil drain from recoil mechanism (5) until no oil runs out.
5.	Using hand, put back washer (7) and plug (6).
6.	Using hand, put back washer (4) and plug (3).
7.	Using rags, wipe up oil spills and drippings.
	GO TO FRAME 2



11-15. RECOIL MECHANISM REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using Allen wrench, remove screw (1), lockwasher (2) and breech lock (3) from breech ring (4).
2.	Using spanner wrench (5), unscrew collar (6) from breech ring (4).
	NOTE Hoist hook must be parallel with recoil mechanism (7) with hook opening facing front.
3.	Position hoist over recoil mechanism (7) with hook parallel to recoil mechanism and hook opening facing muzzle end.
4.	Put rope (8) through hoist hook and bring it down around recoil mechanism (7) between collar (6) and flange (9) at rear of recoil mechanism.
5.	Bring rope (8) up through hoist hook again and then down to wrap around recoil mechanism (7) in front of forward flange (10).
	NOTE Square knot (11) must be tied so that it will be above recoil mechanism (7).
6.	Pull rope (8) tight and tie square knot (11).
7.	Soldier A: Using hoist, lift weight of recoil mechanism (7) off cannon tube (12). Do not overlift. GO TO FRAME 3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HOIST
HOOK
11
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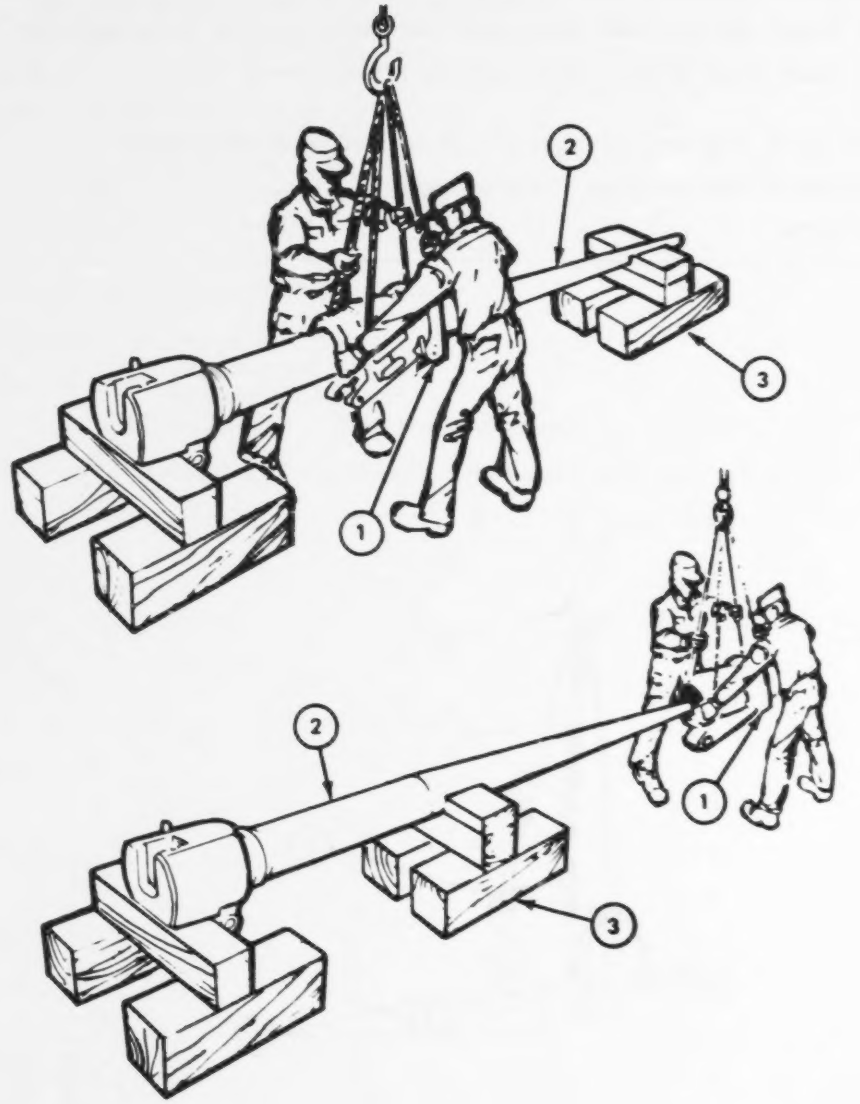
6
12
10
7

best copy available

11-15. RECOIL MECHANISM REMOVAL PROCEDURE (CONT)

FRAME 3

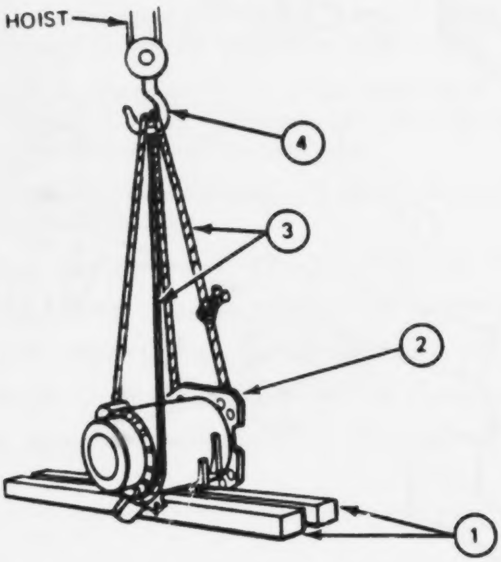
Step	Procedure
	WARNING Recoil mechanism (1) weighs about 3/4 ton. Soldiers must stay from under recoil mechanism when it is lifted by hoist, to prevent injury if it should fall.
	CAUTION Machined surfaces of cannon tube (2) must not be scratched or damaged during removal of recoil mechanism.
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide recoil mechanism (1) and check clearance at all times. If recoil mechanism (1) does not move easily along cannon tube (2) check clearance and rock mechanism in a rotating motion around cannon tube.
1.	Using movable hoist, slide recoil mechanism (1) along cannon tube (2) until front end recoil mechanism reaches blocks (3).
2.	Using hoist, raise recoil mechanism (1) and lift cannon tube (2) off blocks (3).
3.	Move blocks (3) under cannon tube (2) behind recoil mechanism (1).
4.	Using hoist, lower recoil mechanism (1) until cannon tube (2) rests on blocks (3).
5.	Using hoist, move weight of recoil mechanism (1) off cannon tube (2).
6.	Using movable hoist, slide recoil mechanism (1) off muzzle of cannon tube (2).
	GO TO FRAME 4



11-15. RECOIL MECHANISM REMOVAL PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Soldiers B and C: Put wood blocks (1) on level ground.
2.	Soldier A: Using movable hoist, move recoil mechanism (2) over wood blocks (1).
3.	Soldier A: Using hoist, lower recoil mechanism (2) onto wood blocks (1). Put slack in ropes (3).
4.	Soldiers B and C: Slip loops of ropes (3) off ends of recoil mechanism (2).
5.	Soldiers B and C: Remove ropes (3) from hook (4).
	END OF TASK



11-16. RECOIL MECHANISM INSTALLATION PROCEDURE

TOOLS: 5/16" hex head socket (3/8" drive)
Torque wrench adapter (collar to breech ring)
Movable hoist (4 ton capacity)
5/16" socket head screw key (Allen wrench)
Spanner wrench (NSN 5120-00-986-3129)
3/4" drive torque wrench (0 to 600 foot-pounds)
3/8" drive torque wrench (0 to 50 foot-pounds)
Wire brush

SUPPLIES: Grease (item 12, App. A)
Rags (item 21, App. A)
Crocus cloth (item 7, App. A)
Dry cleaning solvent (item 33, App. A)
Rope (20 feet long) (3/4" diameter)

PERSONNEL: Three (including hoist operator)

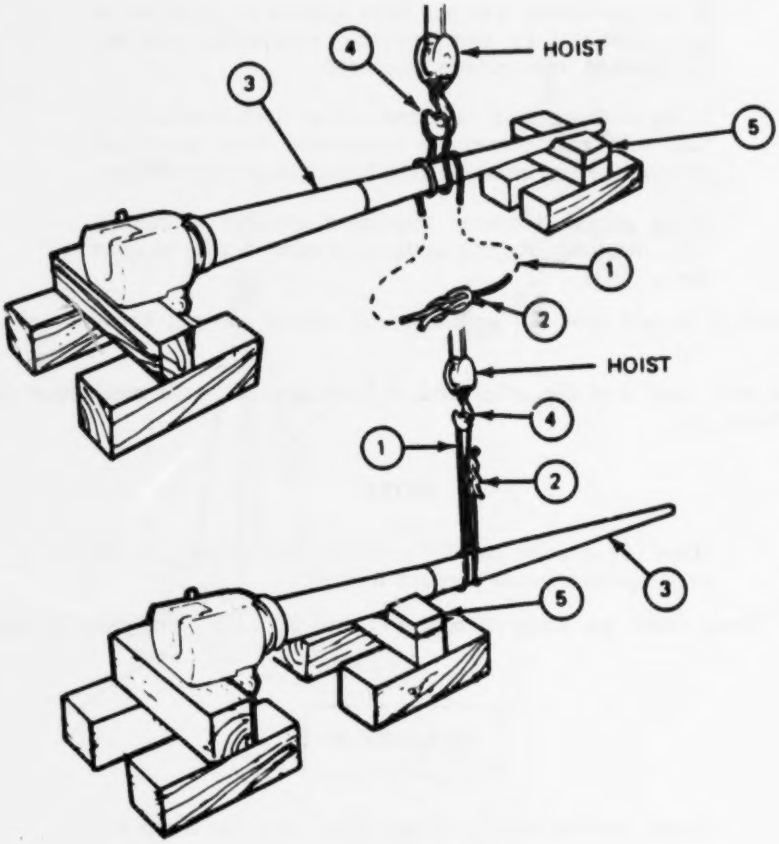
REFERENCES: JPG for procedures to:
Use torque wrench
Remove dirt and rust
LO 9-2350-257-12 for lubricating procedure

PRELIMINARY PROCEDURES: Install cannon tube and breech ring (para 11-21)

11-16. RECOIL MECHANISM INSTALLATION PROCEDURE (CONT)

FRAME 1

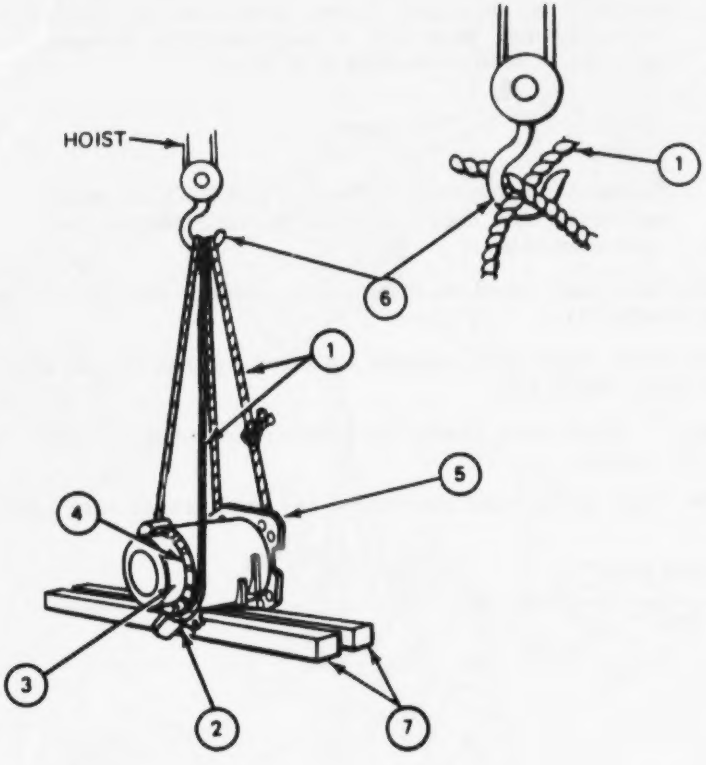
Step	Procedure
1.	Tie ends of rope (1) together with a square knot (2) forming loop.
2.	Wrap one end of looped rope around cannon tube (3) at bore evacuator location and push either end through first end forming a closed sling around cannon tube.
3.	Put loop of rope (1) in hook (4) of hoist.
4.	Soldier A: Using hoist, take up slack until square knot (2) is tight.
	WARNING Keep feet and other parts of body from under cannon tube (3) when cannon tube is lifted or held off blocks (5). If cannon drops accidentally, cannon tube can cause serious injury.
5.	Soldier A: Using hoist, lift cannon tube (3) off wood blocks (5).
6.	Move wood blocks (5) under cannon tube (3) back so that they are on breech side of rope (1).
7.	Soldier A: Using hoist, lower cannon tube (3) on wooden block (5).
8.	Remove rope (1) from hook (4) but do not untie knot (2). Looped rope will be used in Frame 2.
	GO TO FRAME 2


HOIST
HOIST

11-16. RECOIL MECHANISM INSTALLATION PROCEDURE (CONT)

FRAME 2

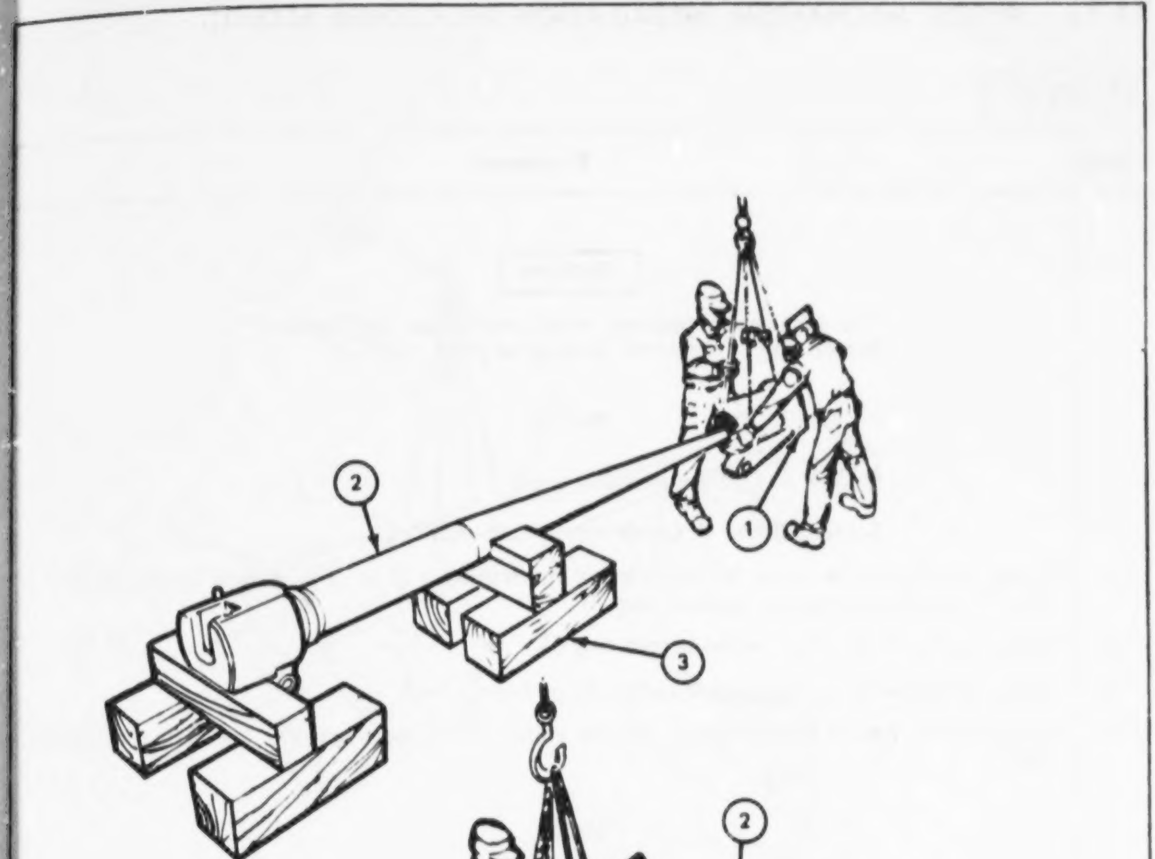
Step	Procedure
	NOTE If rust preventive has just been applied or if vehicle is going into storage, rust preventive compound must not be removed from cannon tube bore. Using cleaning fluid, rags, and crocus cloth, remove dirt, rust, and rust preventive compound from machined surfaces, before installing recoil mechanism (1) (JPG). Using grease, lubricate unpainted surfaces of cannon tube and inner bearing surfaces of cannon tube support sleeve (LO).
1.	Slip one end of looped rope (1) around recoil mechanism (2) between collar (3) and flange (4).
2.	Cross rope over itself and slip other end of loop around recoil mechanism (2) in front forward flange (5).
	NOTE Hook (6) must be parallel to recoil mechanism (2) with hook opening facing forward flange (5).
3.	Soldier A: Using hoist, put cross of rope (1) into hook (6) and take up slack.
	WARNING Recoil mechanism (2) weighs about 3/4 ton. Keep feet and other parts of body away from under it when lifting or holding it with hoist. If it is dropped accidentally, serious injury to personnel might result.
4.	Soldier A: Using hoist, raise recoil mechanism (2) off blocks (7). GO TO FRAME 3


HOIST

11-16. RECOIL MECHANISM INSTALLATION PROCEDURE (CONT)

FRAME 3

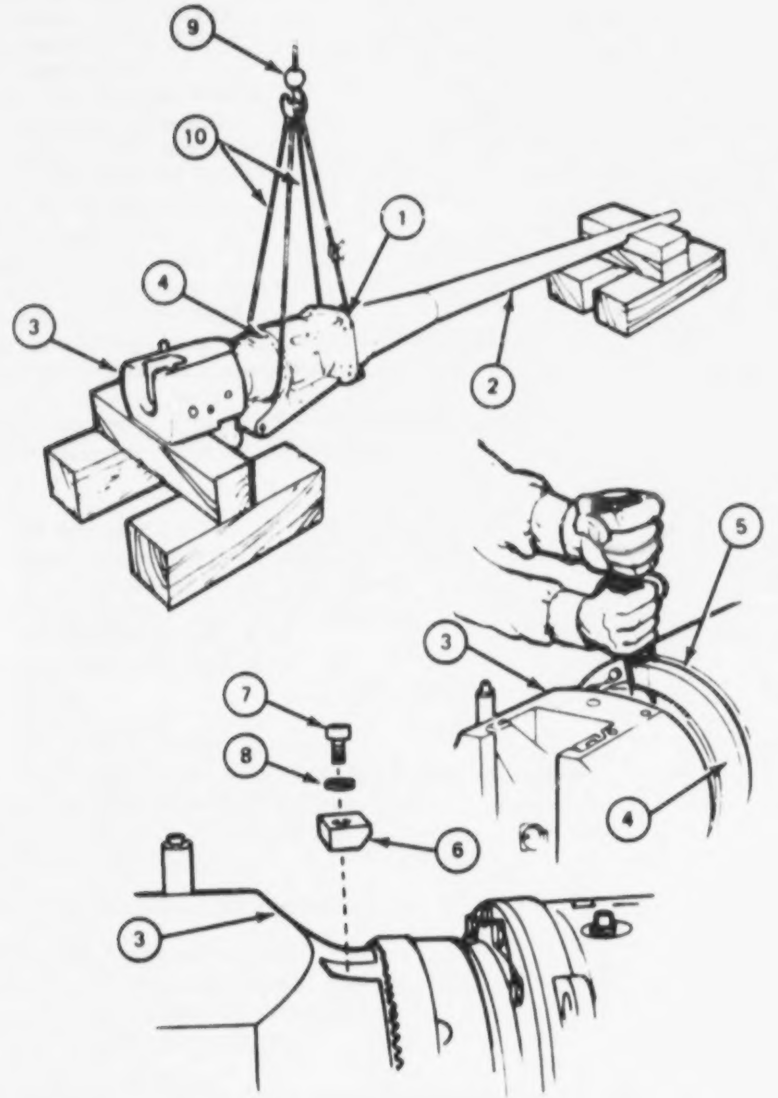
Step	Procedure
	CAUTION Machined surfaces of cannon tube (2) must not be scratched or damaged during installation of recoil mechanism (1). Make sure to keep clearance between cannon and recoil mechanism at all times.
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide recoil mechanism and check clearance between cannon and recoil mechanism.
1.	Using movable hoist, slide recoil mechanism (1) carefully over cannon tube (2) until i reaches wood blocks (3).
2.	Using movable hoist, slowly and carefully lift recoil mechanism (1) and cannon tube (until it is off wood blocks (3).
3.	Soldiers B and C: Move wood blocks (3) to other side of recoil mechanism (1) near cannon tube (2) muzzle.
4.	Using movable hoist, lower recoil mechanism (1) until cannon tube (2) is on wood blocks (3).
	GO TO FRAME 4



11-16. RECOIL MECHANISM INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
	CAUTION Use care when pushing recoil mechanism (1) against breech ring (3) to avoid damage to parts.
	NOTE Soldier A: Operate movable hoist. Soldiers B and C: Guide recoil mechanism (1).
1.	Using movable hoist, raise or lower recoil mechanism (1) as it is moved along cannon tube (2) until it is against breech ring (3).
2.	Using hands, screw collar (4) on breech ring (3).
3.	Using spanner wrench (5), tighten collar (4) on breech ring (3).
4.	Using torque wrench and adapter, tighten collar (4) to between 500 and 510 foot-pounds (JPG).
	NOTE If lock (6) will not fit in collar (4), tighten collar (4) until it does. If this can't be done, loosen collar (4) just enough to have lock (6) fit.
5.	Using Allen wrench, attach lock (6) to breech ring (3) with screw (7) and lockwasher (8).
6.	Using hex head socket and torque wrench, tighten screw (7) to between 30 and 45 foot-pounds.
7.	Remove hoist hook (9).
8.	Untie and remove two ropes (10).
	NOTE Follow-on Maintenance Action Required: Test recoil mechanism (para 11-14). Install gun shield (para 11-12).
	END OF TASK



11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE

TOOLS: Wood block (fabricated tool, item 19, App B) (two)
3/16" socket head screw key (Allen wrench)
1/4" socket head screw key (Allen wrench)
5/8" socket (1/2" drive)
15/16" socket (1/2" drive)
3/4" socket (1/2" drive)
3" extension (1/2" drive)
1/2" drive ratchet
15/16" combination wrench
1/2" drive hinged handle
3/4" combination wrenches (two)
Sling (NSN 4910-00-708-3778)
5/16" flat tip screwdriver
O-ring extractor kit
Diagonal cutting pliers
External retaining ring pliers
Movable hoist (1 ton capacity)
Puller and lifting clamp (NSN 4933-00-039-5025)
Recoil piston adapter spanner wrench,
(fabricated tool, item 20, App. B)
Spring compressor fixture (NSN 4933-00-393-0240)
Thread protector (NSN 4933-00-039-0528)

SUPPLIES: Oil drip pan 3 x 3 x 1/2" to 2" deep
Rope (10 feet long) (1" diameter)
Wood blocks 10" x 10" x 24" (two)
Wood blocks 2" x 4" x 12" (two)
Wood block 4" x 4" x 24"
Tape (item 35, App. A)
Clevis
Eyebolt (two)
Nut (5/8" - 11NC-2) (two)
Flat washer (1/8" thick, 3/4" ID, 1-3/4" OD) (two)
Screw (3/5" - 16 NC-2 (three)
Nut (3/8" - 16 NC-2) (three)
Flat washer (11/16" x 1" x 1/16") (three)

PERSONNEL: Three (including hoist operator)

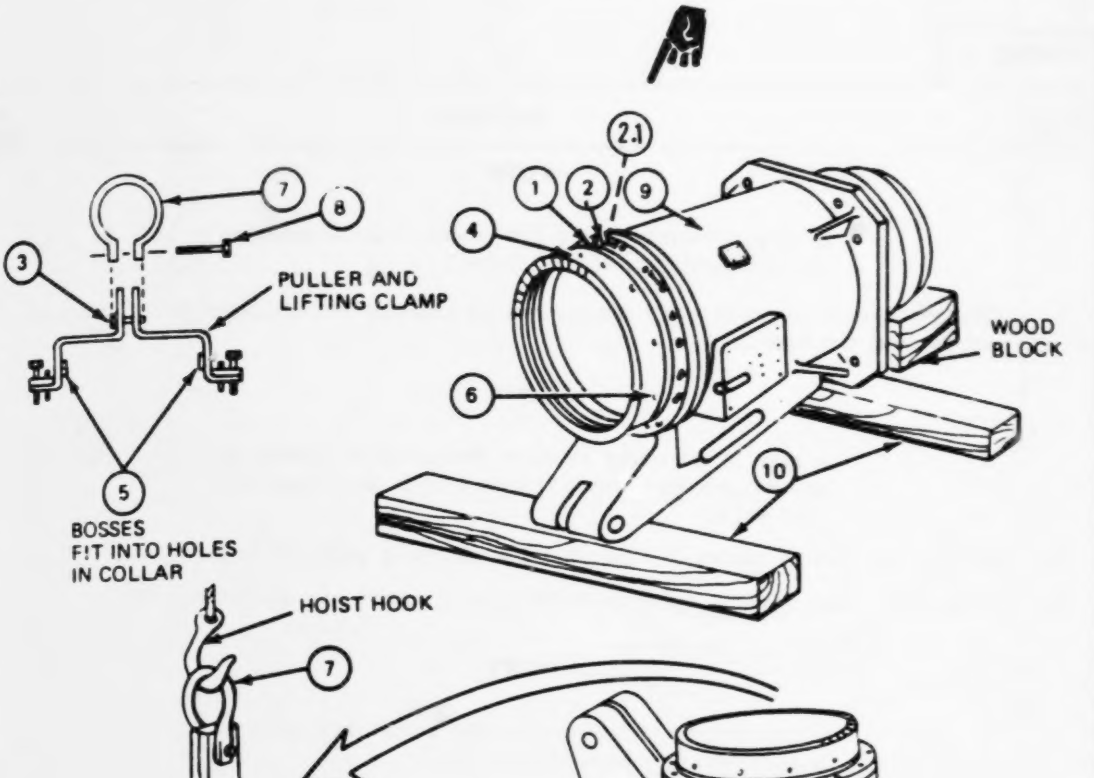
REFERENCES: JPG for procedures to:
Remove preformed packing
Use retaining ring pliers
Remove lockwire

PRELIMINARY PROCEDURES: Test recoil mechanism (para 11-14)
Remove recoil mechanism (para 11-15)

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 1

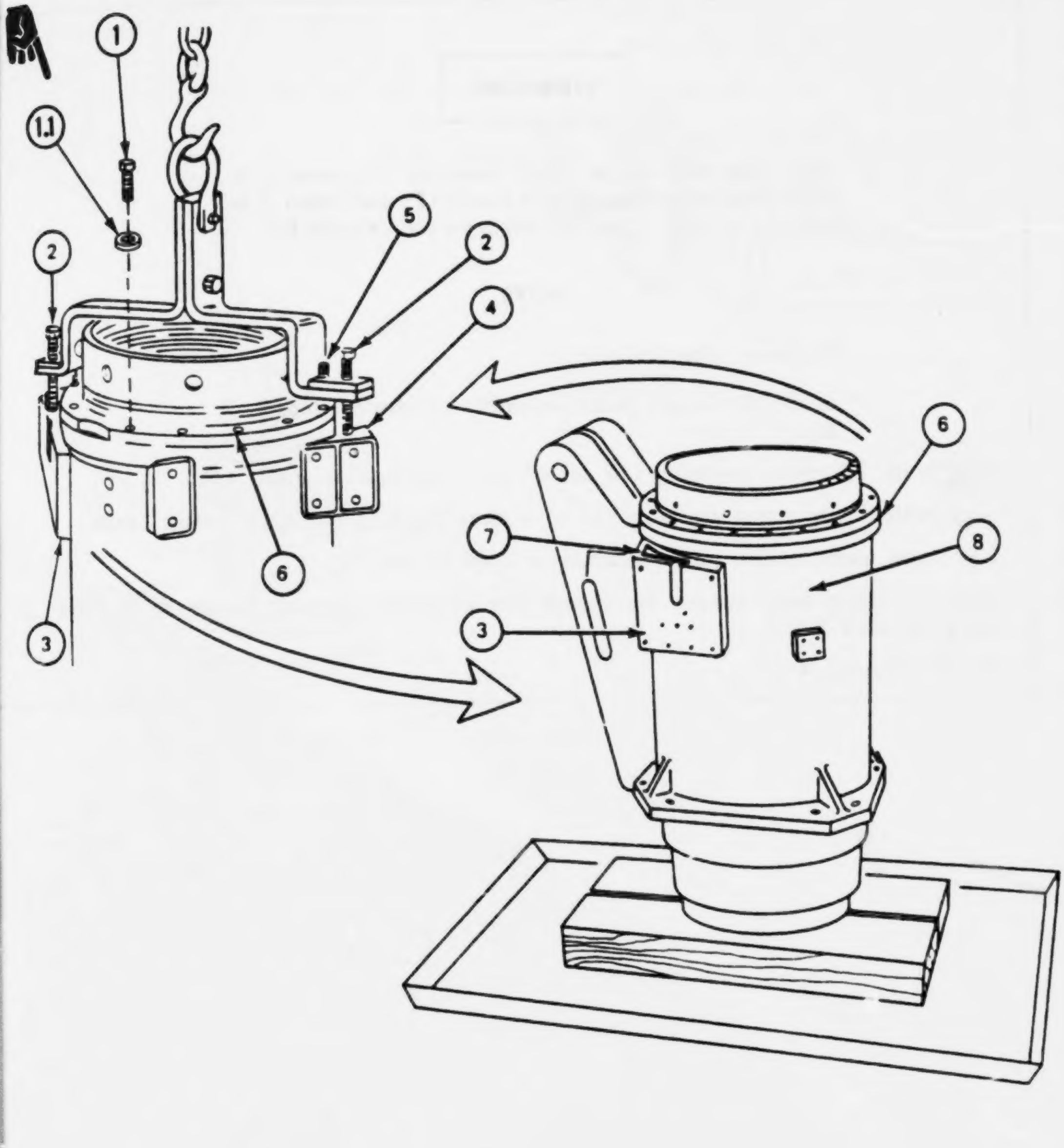
Step	Procedure
	NOTE Keep recoil mechanism (9) on wood block (10). This will help when breaking screws (2) loose.
1.	Using diagonal cutting pliers, remove five lockwires (1) from ten screws (2) (JPG).
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket. Screws (2) at this time are only broken loose and will be removed later.
2.	Using socket and hinged handle, loosen ten screws (2) and ten flat washers (2.1), but do not remove.
3.	Using 3/4" socket wrench and 3/4" combination wrench, loosen nut (3) of puller and lifting clamp.
4.	Using hands, put lifting clamp on collar (4) with two bosses (5) in two holes (6).
5.	Using 3/4" socket wrench and 3/4" combination wrench, tighten nut (3) on lifting clamp.
6.	Using hands, put clevis (7) on lifting clamp and tighten clevis screw (8).
	WARNING Do not put hands, feet, or any part of body under recoil mechanism (9) when recoil mechanism is being lifted or held in raised position. Serious injury could result if recoil mechanism slips or falls.
	NOTE Front of recoil mechanism (9) will tip down when turning to vertical position. A piece of 4" x 4" x 24" wooden block should be laid longway to prevent recoil mechanism from hitting the floor.
7.	Put hoist hook through clevis (7).
8.	Soldier A: Using hoist, carefully lift recoil mechanism (9) off wood blocks into vertical position. Soldiers B and C: Move wood blocks (10) into drip pan.
9.	Soldier A: Using hoist, lower recoil mechanism (9) onto blocks (10) in drip pan. Do no remove lifting hoist hook from clevis (7).
	GO TO FRAME 2


2.1
7
8
1
2
9
3
4
PULLER AND
LIFTING CLAMP
WOOD
BLOCK
6
10
5
BOSSES
FIT INTO HOLES
IN COLLAR
HOIST HOOK
7
9
10
DRIP
PAN

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 2

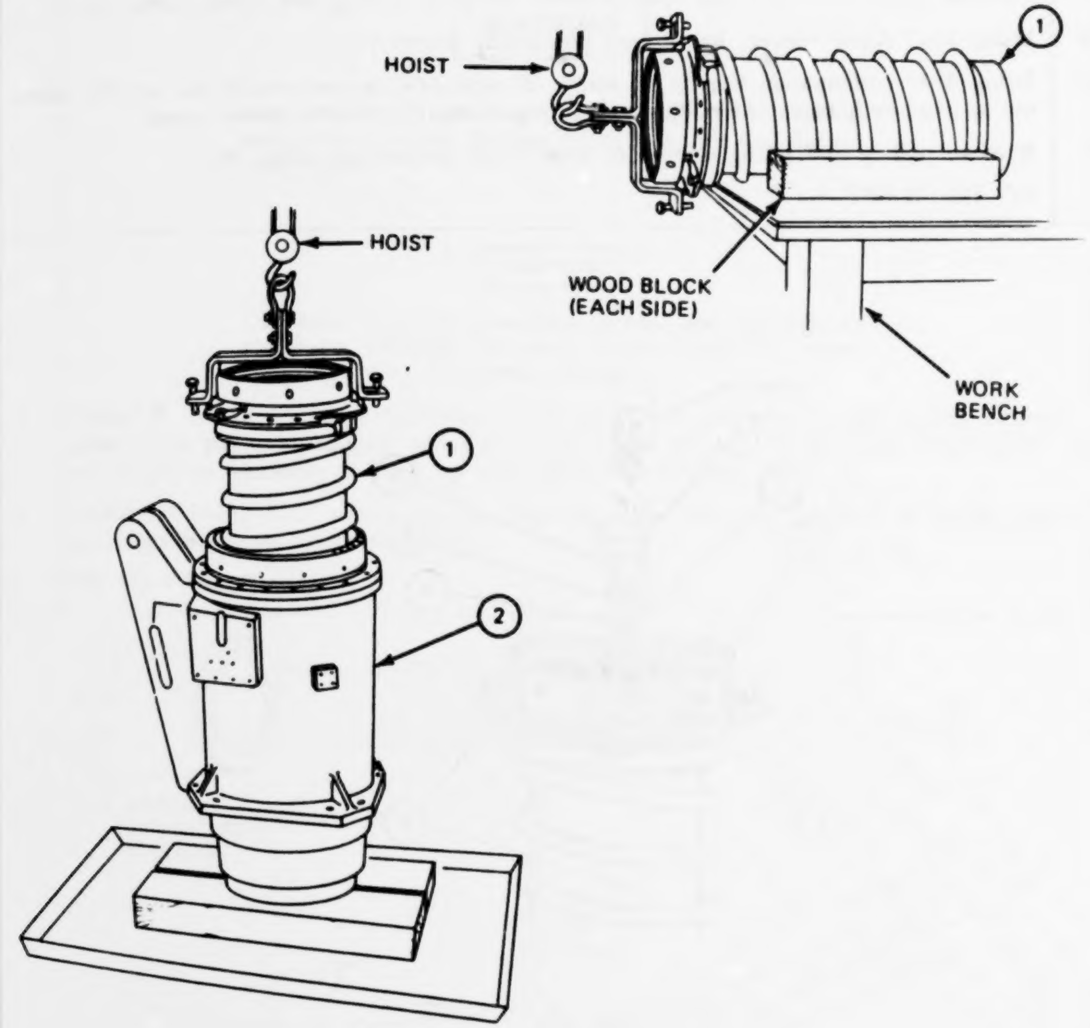
Step	Procedure
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
1.	Using socket wrench, remove ten screws (1) and ten flat washers (1.1). Throw all screws and washers away.
	NOTE It may be necessary to move the clamp and collar to position jacking screws (2) over bracket mounting pads (3) and (4).
2.	Position two jacking screws (2) over bracket mounting pads (3) and (4).
3.	Using 1/4" Allen wrench, tighten two positioning screws (5) against seat (6).
	NOTE Before turning jacking screws, check that they are over bracket mounting pads (3) and (4).
4.	Put metal block (7) on bracket mounting pad (3) directly under jacking screw (2) on that side.
5.	Using 3/4" socket wrench, turn two jacking screws (2) until screws touch bracket mounting pad (4) and block (7).
6.	Using 3/4" socket wrench, turn each jacking screw (2) one turn at a time until seat (6) separates from recoil mechanism (8).
	GO TO FRAME 3


1
1.1
2
5
2
4
6
3
6
7
8
3

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 3

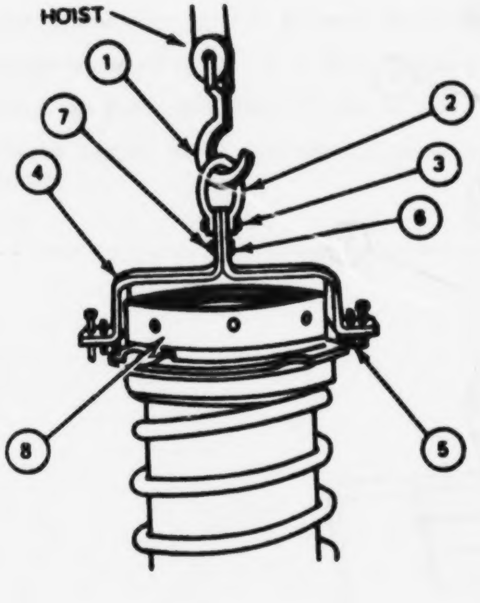
Step	Procedure
	WARNING Stay clear from under piston assembly (1) when it is lifted from recoil mechanism cradle (2) and when it is lowered by hoist to prevent being hurt if it should fall. **NOTE** Soldier A: Operate hoist. Soldier B: Steady piston assembly (1) during steps 1, 2 and 3.
1.	Using hoist, lift piston assembly (1) out of recoil mechanism cradle (2).
2.	Using hoist, lower piston assembly (1) to a clean working surface on work bench.
3.	Using hoist, carefully lay piston assembly (1) on its side.
4.	Soldier C: Using wood blocks, block each side of piston assembly to prevent it from rolling off work bench.
	GO TO FRAME 4


HOIST
1
WOOD BLOCK (EACH SIDE)
WORK BENCH
HOIST
1
2

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 4

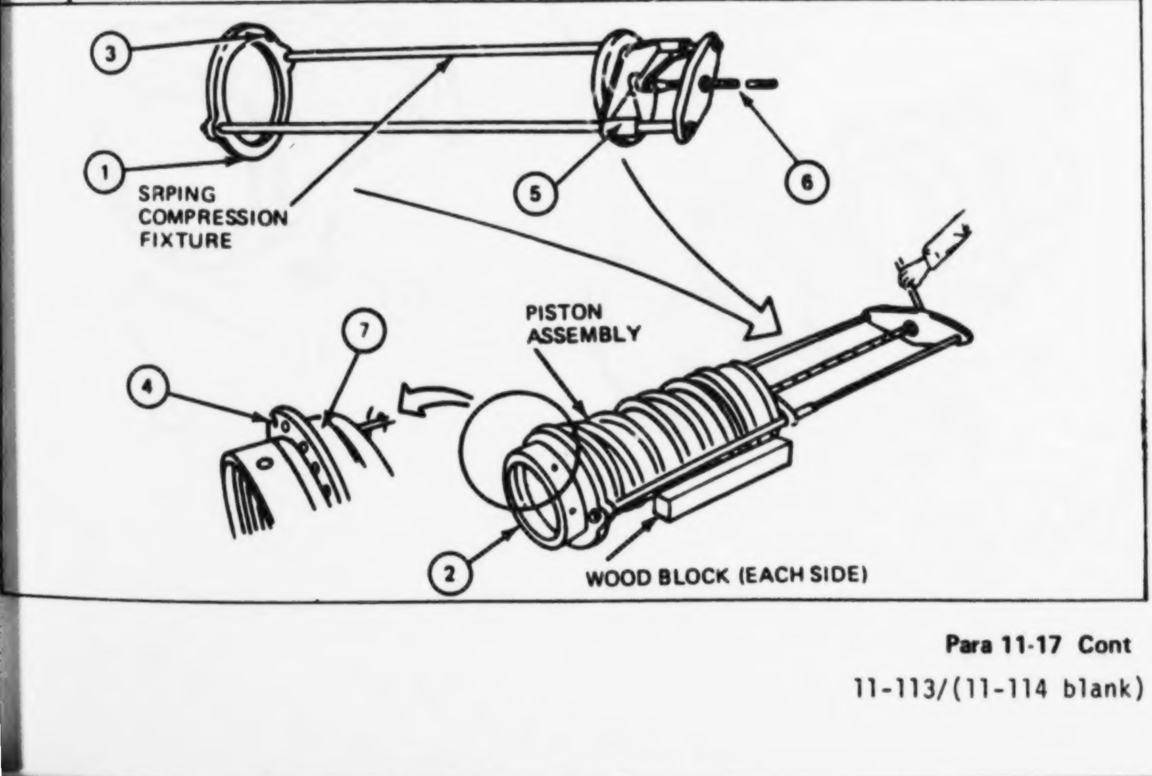
Step	Procedure
1.	Remove hoist hook (1) from clevis (2).
2.	Unscrew clevis screw (3) and remove clevis (2) from pulling and lifting clamp (4).
3.	Using 1/4" Allen wrench, loosen two positioning screws (5).
4.	Using 3/4" combination wrench on screw (6) and 3/4" socket wrench on nut (7), loose nut so that both halves of pulling and lifting clamp (4) can be spread apart.
5.	Remove pulling and lifting clamp (4) from recoil mechanism collar (8).
	GO TO FRAME 5



11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
	WARNING Use extreme care when working with spring compression fixture. Serious injury to hands and fingers could result.
	CAUTION Use care to avoid scratches, dents, and damage to machined surfaces of recoil piston assembly when installing spring compression fixture.
1.	Soldier B: Install spring compression fixture on piston assembly so that spring retainer plate (1) is put over adapter collar (2), two dowel pins (3) fit in holes in cover (4), and end of piston assembly is lined up with plate and bracket (5).
2.	Soldier C: Using 5/8" socket wrench, turn jackscrew (6) until pressure of spring seat (7) no longer bears on adapter collar (2).
	GO TO FRAME 6

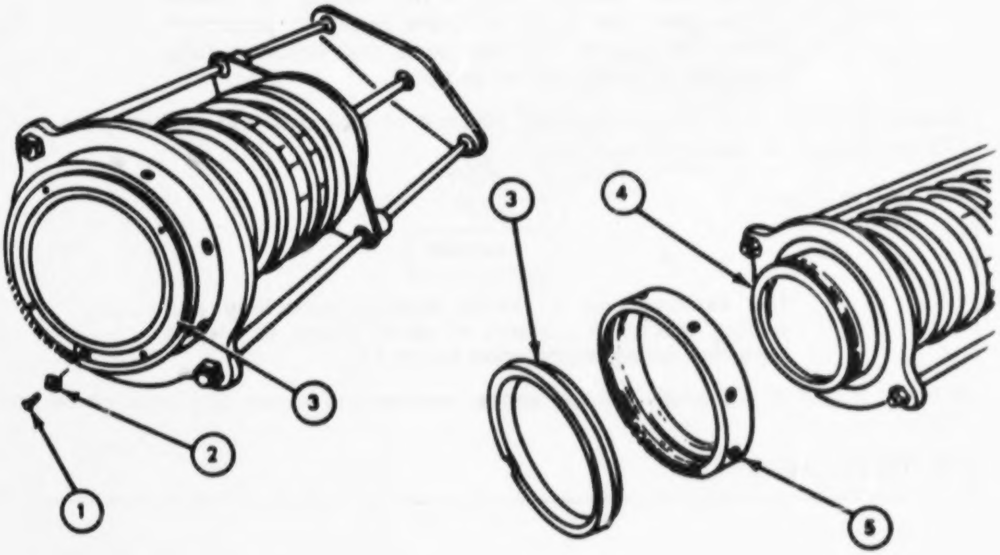


Para 11-17 Cont

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 6

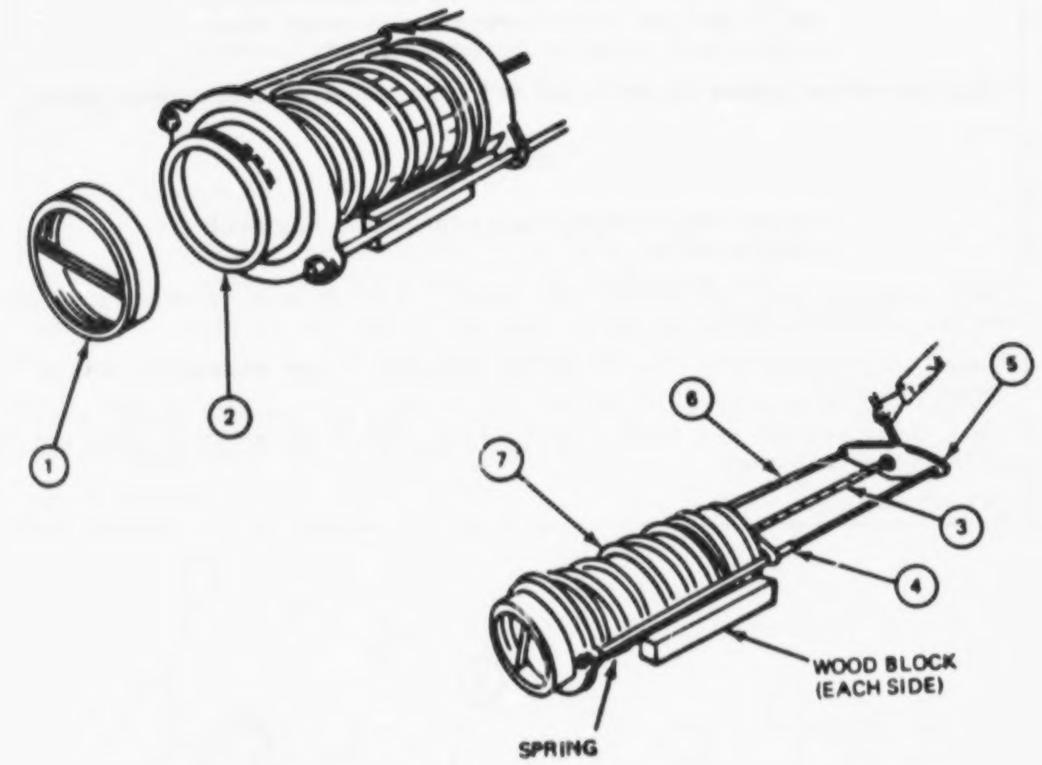
Step	Procedure
1.	Using screwdriver, remove screw (1) and key (2) from recoil piston adapter (3). **CAUTION** Use care when removing recoil piston adapter (3) and breech ring adapter collar (5) so as not to damage threads on recoil piston (4).
2.	Using recoil piston adapter spanner wrench, carefully remove recoil piston adapter (3) from recoil piston (4).
3.	Carefully slide off and remove breech ring adapter collar (5) from recoil piston (4). GO TO FRAME 7



11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 7

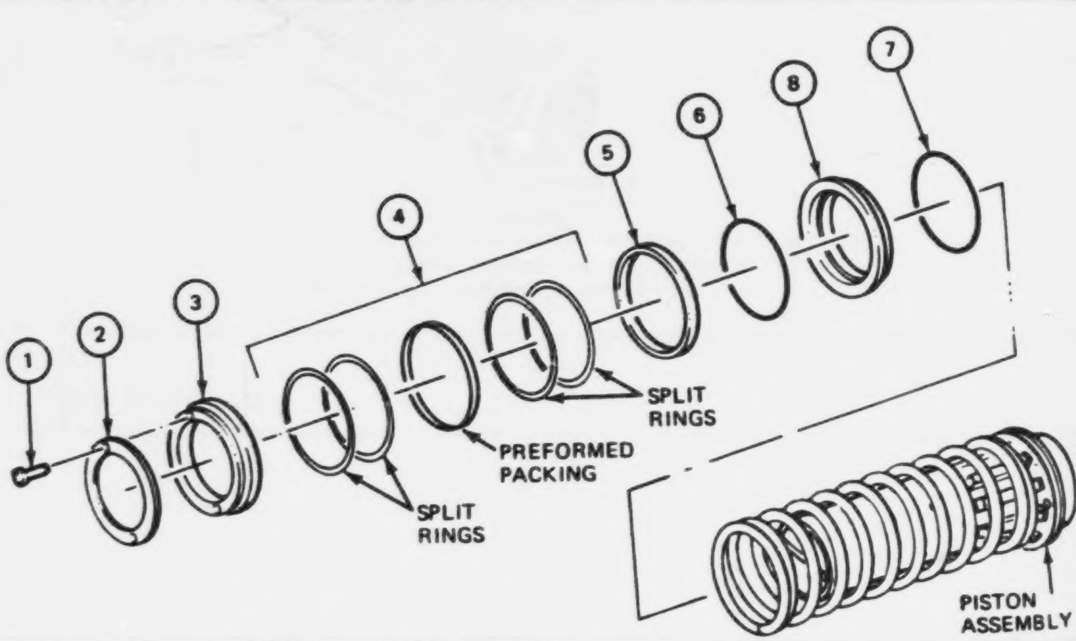
Step	Procedure
	CAUTION Make sure thread protector tool (1) screws on recoil piston (2) straight so as not to damage threads. Do not overtighten. Thread protector must remain on recoil piston at all times until removed at assembly (para 11-18).
1.	Soldier B: Screw thread protector tool (1) on recoil piston (2) far enough so that no ga shows between thread protector tool and shoulder of recoil piston.
	WARNING Length of recoil piston is about 31 inches. Length of spring is about 47 inches when spring tension is released. Removal of piston assembly (7) from spring compression fixture (6), while spring is under compression, can result in severe injury to personnel. Make sure spring does not bend and becomes fully extended (no compression) in step 2.
2.	Soldier C: Using 5/8" socket wrench, turn end of jackscrew (3) so that plate and bracke (7) are moved to end bracket (5).
	CAUTION Use extreme care to avoid denting, scratching and scoring machined surfaces of recoil piston (2) when removing spring compression fixture (6).
3.	Soldiers B and C: Carefully remove spring compression fixture (6) from piston assembly (7). GO TO FRAME 8


WOOD BLOCK
(EACH SIDE)
SPRING

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 8

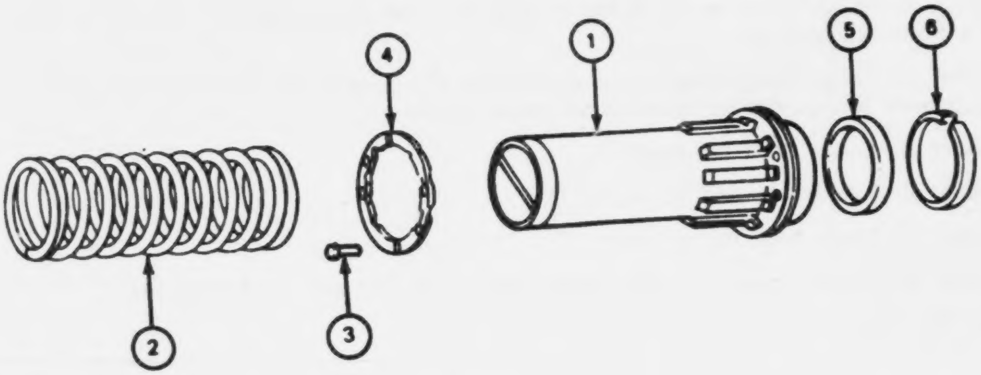
Step	Procedure
	NOTE Retainer cover (3), seal retainer (5), and spring seat (8) were forced off piston assembly by spring when compression of spring was released in frame 7.
1.	Using screwdriver, remove six screws (1) and spacer (2) from retainer cover (3).
	NOTE Two split rings are on each side of preformed packing of seal assembly (4).
2.	Using O-ring extractor tool, remove seal assembly (4) from inner circumference of sea retainer (5) (JPG). Throw seal assembly away.
3.	Using O-ring extractor tool, remove seal (6) from face of seal retainer (5) (JPG). Throw seal away.
4.	Using O-ring extractor tool, remove seal (7) from outer circumference of spring seat ((JPG). Throw seal away.
	GO TO FRAME 9



11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 9

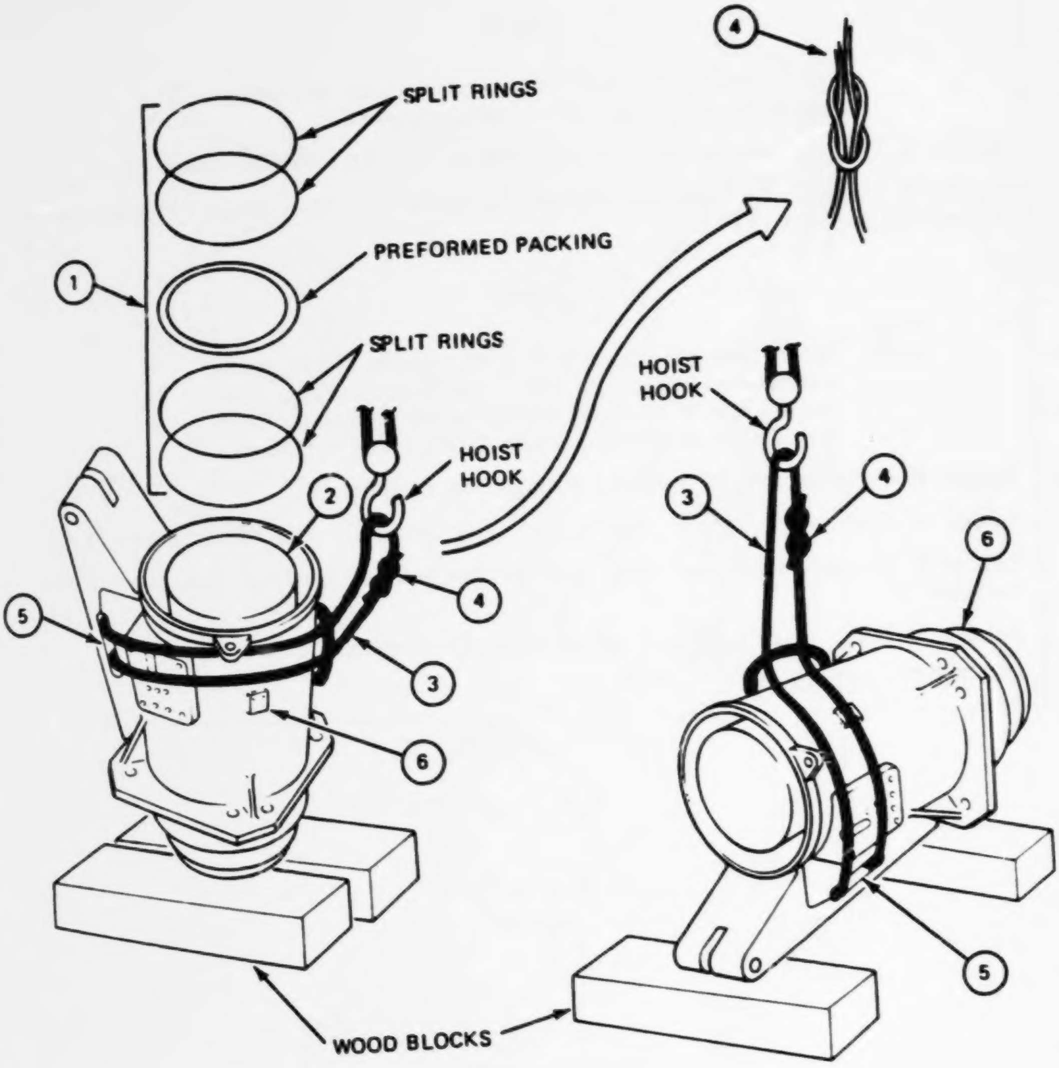
Step	Procedure
	CAUTION Piston (1) scratches easily. Use extreme care when removing spring (2) from piston.
1.	Soldier A: Hold piston (1). Soldier B: Carefully slide spring (2) from piston (1).
	NOTE If spring recoil ring (4) has two dowel pin holes, as well as four screw holes in it, do not do steps 2 and 3 unless spring recoil ring is damaged and requires replacement.
2.	Using 3/16" Allen wrench, remove four screws (3) from piston (1).
3.	Remove spring recoil ring (4) from piston (1).
4.	Using external retaining ring pliers, remove retaining ring (5) from piston (1) (JPG).
5.	Remove recoil inertia valve (6) from piston (1).
	GO TO FRAME 10



11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 10

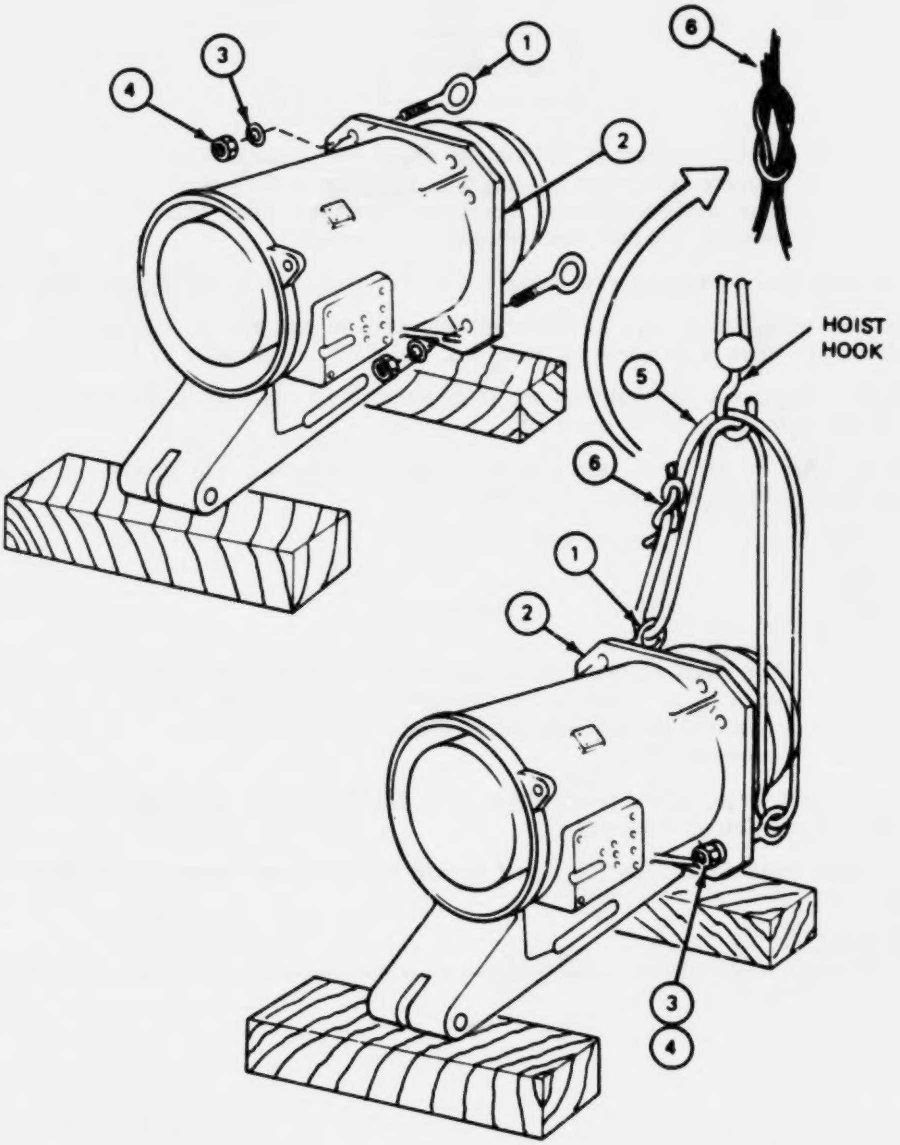
Step	Procedure
	NOTE Recoil mechanism (6) was left in vertical position on two wood blocks in frame 3.
1.	Using O-ring extractor tool, remove seal assembly (1) by removing four split rings and preformed packing from support sleeve (2) (JPG). Throw seal assembly away.
2.	Using rope (3), make a loop and tie ends with a square knot (4).
3.	Push one end of looped rope (3) through slot (5) of recoil mechanism (6) and bring around recoil mechanism through other end loop so as to form a sling around recoil mechanism.
	WARNING Stay clear from underneath recoil mechanism (6) when it is lifted and lowered. If it falls accidentally, serious injury to personnel could result.
4.	Soldier B: Put hoist hook through rope (3).
5.	Soldier A: Using hoist, take up slack and tighten knot (4).
6.	Soldier A: Using hoist, carefully lift recoil mechanism (6) off two wood blocks and mov it to one side.
7.	Soldier B: Position two wood blocks to support recoil mechanism (6) when it is lowere to a horizontal position.
8.	Soldier A: Using hoist, lower recoil mechanism (6). Soldier B: Guide and tip recoil mechanism to a horizontal position on wood blocks.
9.	Soldier A: Lower hoist for slack.
10.	Soldier B: Remove hook from rope (3).
11.	Soldier A: Move hoist out of way.
12.	Soldier B: Remove rope (3) from recoil mechanism (6) and untie knot (4).
	GO TO FRAME 11


SPLIT RINGS
PREFORMED PACKING
SPLIT RINGS
①
②
③
④
⑤
⑥
HOIST HOOK
HOIST HOOK
④
③
④
⑥
⑤
⑥
⑤
④
WOOD BLOCKS

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 11

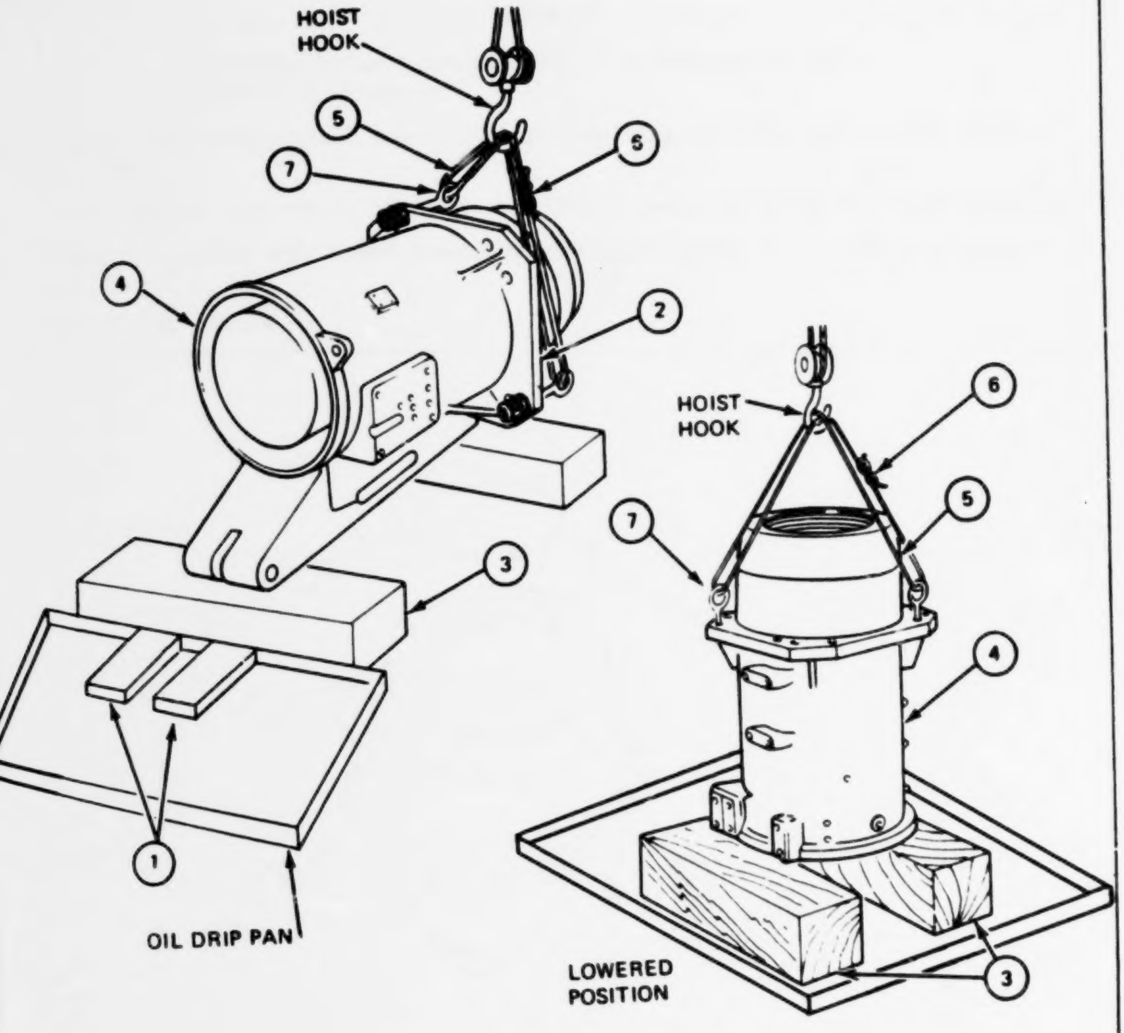
Step	Procedure
	NOTE Two eyebolts (1) must be located in recoil mechanism flange (2) diagonally across from each other.
1.	Soldier B: Put two eyebolts (1) through holes in recoil mechanism flange (2).
2.	Soldier B: Using 15/16" combination wrench, install two flat washers (3) with two nuts (4) on two eyebolts (1).
	NOTE When fastening rope (5) to two eyebolts (1) in recoil mechanism flange (2), cross rope over itself so that crossed rope in hook will prevent recoil mechanism from slipping out of vertical position during lifting operation.
3.	Soldier B: Pass one end of rope (5) through two eyebolts (1).
4.	Soldier B: Cross rope (5) over itself before tying two ends with square knot (6).
5.	Soldier B: Put rope cross over hoist hook so that hook is lined up parallel with two eyebolts (1).
6.	Soldier A: Using hoist, take up slack in rope (5) to tighten square knot (6).
	GO TO FRAME 12


HOIST HOOK

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 12

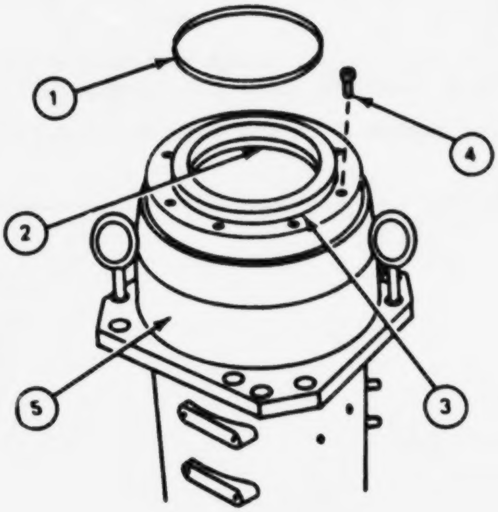
Step	Procedure
	WARNING Recoil mechanism (2) weighs about 900 pounds. Use extreme care when hoisting and handling it. Stay clear from underneath recoil mechanism when it is lifted and lowered. If it falls, serious injury could result.
1.	Place oil drip pan containing two wood blocks (1) near end of recoil mechanism (2).
2.	Position two wood blocks (1) so that they will prevent damage to end of recoil mechanism (2) when it is tilted by hoist and slides off wood block (3).
3.	Soldier A: Using hoist, carefully lift recoil mechanism (2) so that it tilts into pan allowing any remaining oil to drain off.
4.	Soldier A: After oil runs out, continue to lift recoil mechanism (2) slowly into an uprigh position. Soldier B: Steady recoil mechanism (2).
5.	Remove two blocks (1) from oil drip pan.
	NOTE Two wood blocks, used to support recoil mechanism (2) when it is lowered in upright position, must be positioned so that only outer cylinder cradle (4) rests on two wood blocks.
6.	Soldier A: Using hoist, lower recoil mechanism (2). Soldier B: positions two wood blocks (3) under outer cylinder cradle (4).
7.	Remove hoist hook from rope (5), untie square knot (6), and remove rope from two eyebolts (7).
	GO TO FRAME 13


HOIST HOOK
HOIST HOOK
OIL DRIP PAN
LOWERED POSITION

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 13

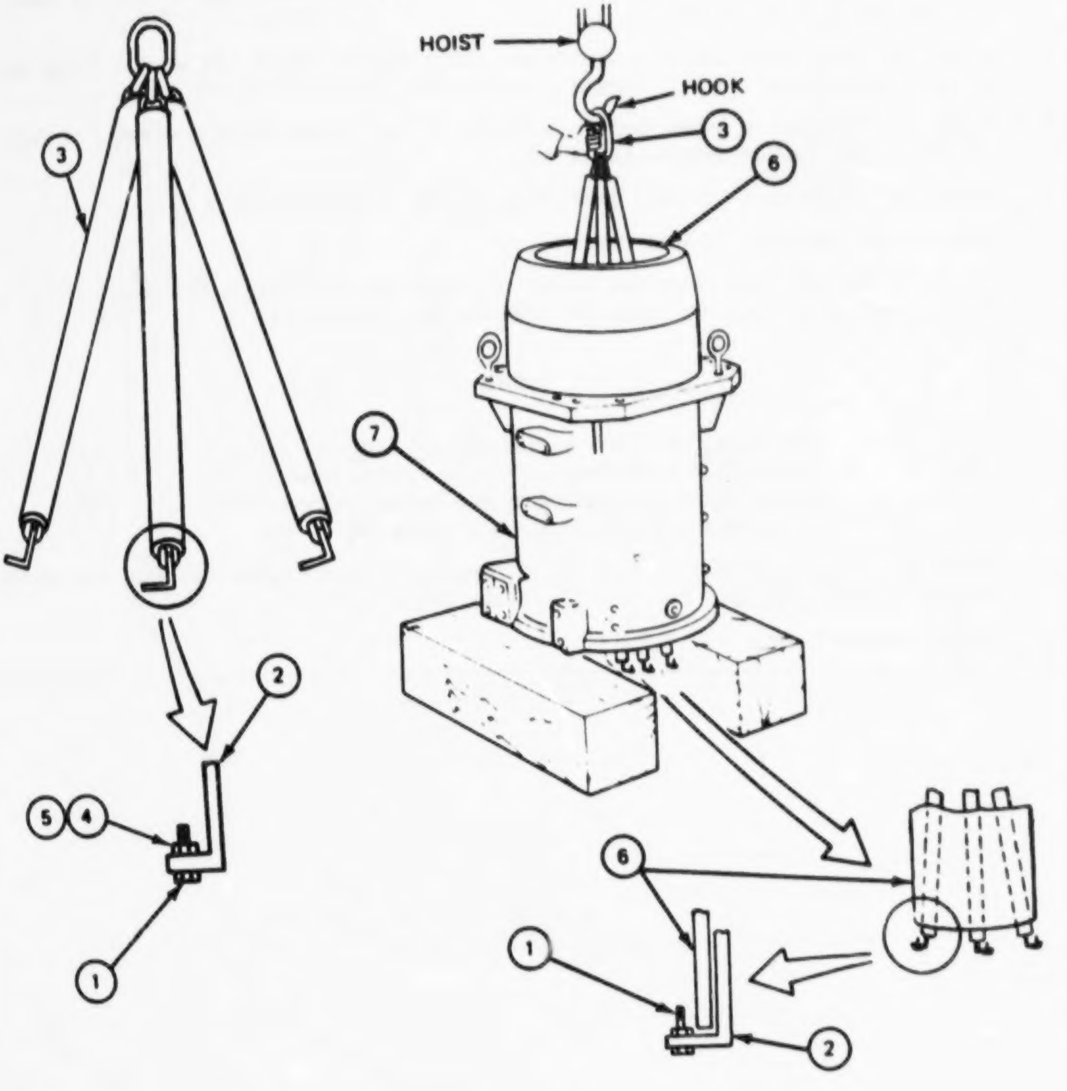
Step	Procedure
	NOTE Do step 1 if seal quadrant ring (1) is damaged or gun tube is to be replaced.
1.	Using O-ring extractor tool, remove seal quadrant ring (1) from inside groove of sleeve (2) (JPG).
2.	Using diagonal wire cutting pliers, cut and remove lacing wires (3) from eight screws (4).
3.	Using 5/8" socket with hinged handle, remove eight screws (4) from recoil mechanism (5).
	GO TO FRAME 14



11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 14

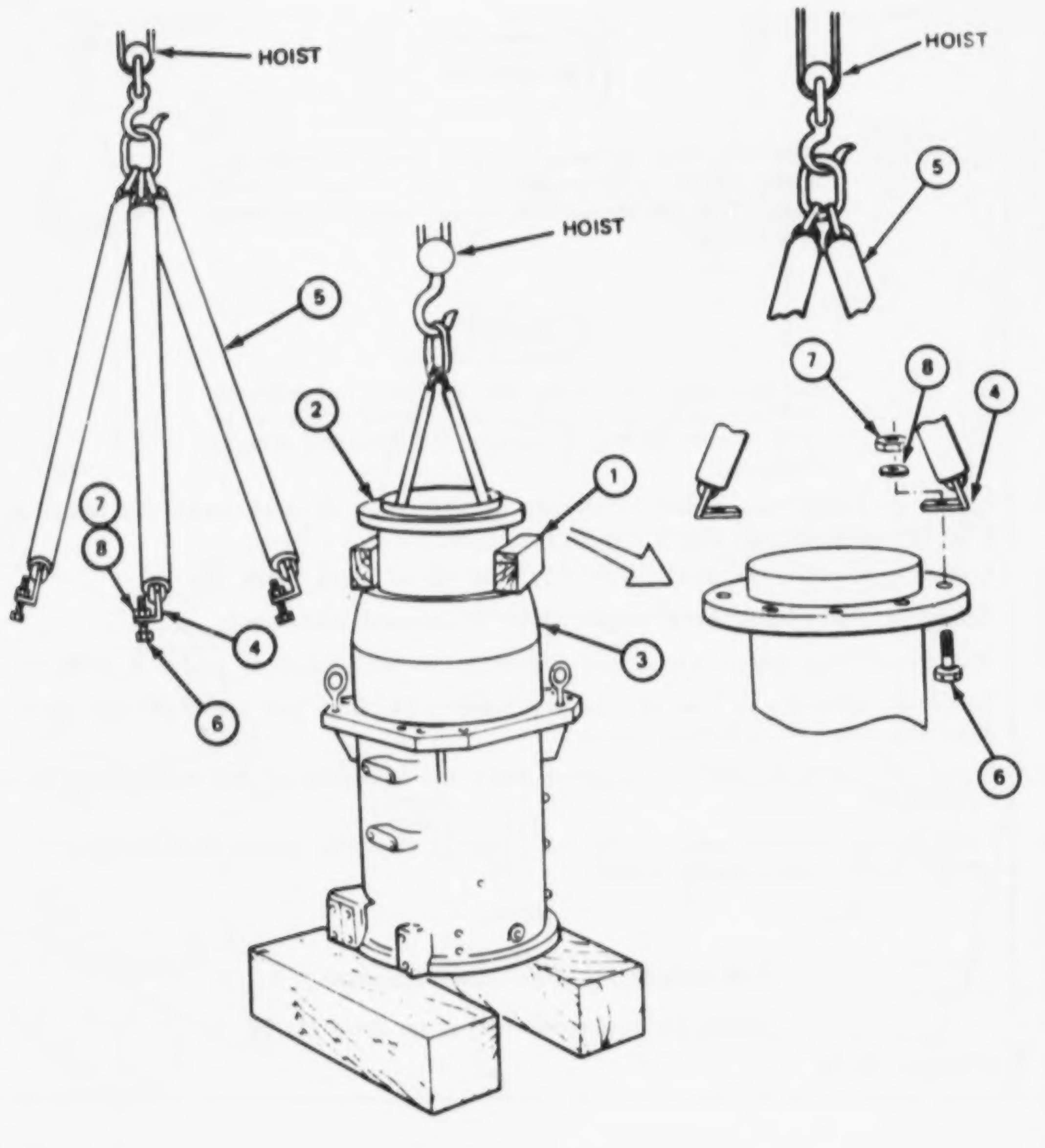
Step	Procedure
1.	Put three screws (1) through three hooks (2) of hoisting sling (3).
2.	Put three flat washers (4) and three nuts, (5) on three screws (1) and screw down fin tight.
3.	Using tape, wrap one layer around each of three screws (1) and three nuts (5) to pro support sleeve (6).
4.	Put sling (3) on hoist hook.
5.	Soldier A: Using hoist, lower sling (3) into recoil mechanism (7) until three hooks (2 reach just below bottom of recoil mechanism.
	NOTE Three hooks (2) must be positioned around bottom of support sleeve (6) about 120 degrees apart with bottom of support sleeve resting between three screws (1) and three hooks (2).
6.	Soldier A: Using hoist, raise sling (3) just enough so Soldier B can position three ho (2) around bottom of support sleeve (6) about 120 degrees apart.
7.	Soldier A: Using hoist, raise support sleeve (6) about five inches out of recoil cradle.
	GO TO FRAME 15


HOIST
HOOK

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 15

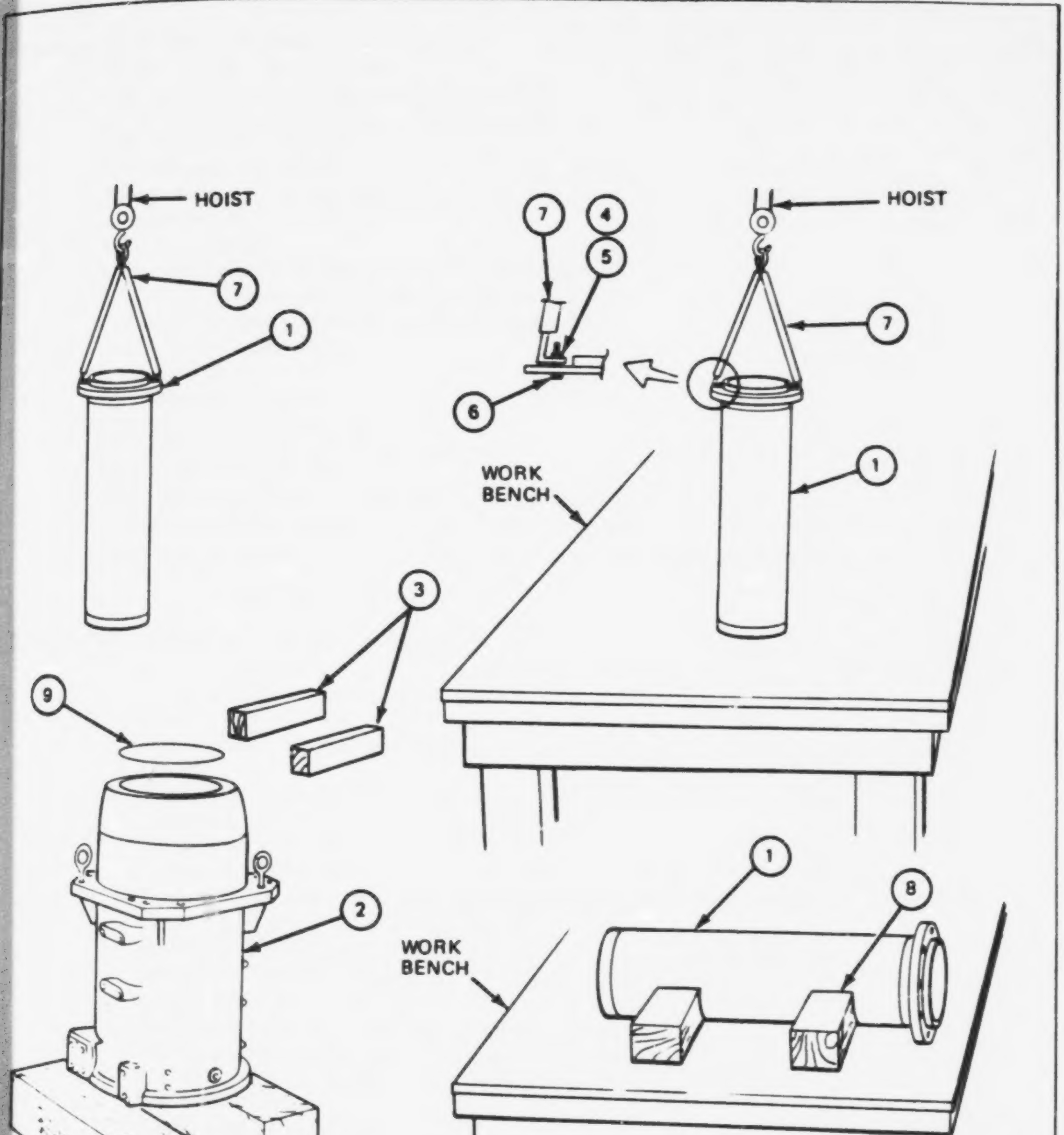
Step	Procedure
1.	Soldier B: Put two wood blocks (2" x 4" x 12") (1) between flange of support sleeve (2) and top of recoil cradle (3).
2.	Soldier A: Using hoist, slowly and carefully lower support sleeve (2) so that flange rests on two wood blocks (1) and support sleeve is fully supported by two wood blocks.
3.	Soldier A: Continue to lower hoist until Soldier B can release three hooks (4) of sling (5) from lower end of support sleeve (2).
4.	Soldier A: Using hoist, carefully raise sling (5) out of support sleeve (2).
5.	Remove one sling leg (5) from hoist.
6.	Soldier B: Remove tape from two screws (6), and two nuts (7) on two hooks (4). Remove two screws (6), two nuts (7), and two flat washers (8).
	NOTE Two hooks (4) must be attached to flange of support sleeve (2) in holes diagonally across (or as close to 180 degrees apart as possible) to give proper balance when lifting support sleeve out of recoil cradle (3).
7.	Soldier B: Attach two hooks (4) to top of flange of support sleeve (2) with two screws (6), two washers (8), and two nuts (7). Make finger tight.
	GO TO FRAME 16


HOIST
HOIST
HOIST

11-17. RECOIL MECHANISM DISASSEMBLY PROCEDURE (CONT)

FRAME 16

Step	Procedure
	WARNING Stay clear from underneath support sleeve (1) when it is lifted out of recoil cradle (2) and lowered to work bench. If it falls accidentally, serious injury to personnel could result. **CAUTION** Support sleeve (1) must not be tilted and must be carefully guided as it is lifted out of recoil cradle (2) so as to prevent binding, scratching, and damaging support sleeve.
1.	Soldier A: Using hoist, slowly lift support sleeve (1) out of recoil cradle (2). Soldier B: Carefully guide support sleeve (1).
2.	Soldier B: Remove two wood blocks (3) from top of recoil cradle (2).
3.	Soldier A: Using hoist, move support sleeve (1) toward work bench.
4.	Soldier A: Using hoist, lower support sleeve (1) to work bench as soldier B guides it.
5.	Soldier B: Remove two nuts (4) and two washers (5) from two screws (6) that attach hoist and sling (7) to support sleeve (1).
6.	Soldiers B and C: Carefully lay support sleeve (1) in cutouts of two wood blocks (8) on work bench.
7.	Using O-ring extractor tool, remove seal assembly (9) from top of recoil cradle (2) (JPG). Throw seal assembly away. **NOTE** Follow-on Maintenance Action Required: Inspect parts of recoil mechanism (para 11-13).
	END OF TASK


HOIST
HOIST
WORK BENCH
WORK BENCH

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE

TOOLS: 3/16" hex head socket (3/8" drive)
15/16" combination wrench
1/4" socket head screw key (Allen wrench)
3/16" socket head screw key (Allen wrench)
5/8" socket (1/2" drive)
3/4" socket (1/2" drive)
15/16" socket (1/2" drive)
3" extension (1/2" drive)
1/2" drive ratchet
5/16" flat tip screwdriver (with 3/8" drive end)
3/8" drive torque wrench (0-50 foot-pounds)
1/2" drive torque wrench (0 to 250 foot-pounds)
5/16" flat tip screwdriver
Long nose pliers
Diagonal cutting pliers
External retaining ring pliers
Movable overhead hoist, 1 ton capacity
Sling (NSN4910-00-708-3778)
Puller and lifting clamp (NSN 4933-00-039-5025)
Spring compression fixture (NSN 4933-00-393-0240)
Recoil piston adapter spanner wrench, (fabricated tool, item 20, App. B)
Thread protector
3/4" combination wrench (two)

SUPPLIES: Repair kit (seals) (5911134)
Rope (20 feet long) (3/4" diameter)
Wood blocks, 10" x 10" x 24" (two)
Wood blocks, 4" x 4" x 24" (two)
Wood blocks, 6" x 6" x 18" (two)
Clevis
Wood block, 2" x 4" x 12" (two)
Lockwire (MS 20995-F41)
Lockwire (MS 20995-F47)
Lockwire (QQ-W-461)
Eyebolts with nuts (NSN-5306-00-050-0348) (two)
Flat washer 3/4 x 1-3/4 x 1/8" (two)
Screws (MS 21262-44) (four)
Screw 3/8" 16NC-2 (three)
Screws (MS 18153-114) (ten)
Flat washer 11/16 x 1 x 1/16" (three)
Grease (item 12, App. A)
Nut 3/8" 16NC-2 (three)
Nut 5/8" 11NC-2
Tape (item 35, App. A)

PERSONNEL: Three (including hoist operator)

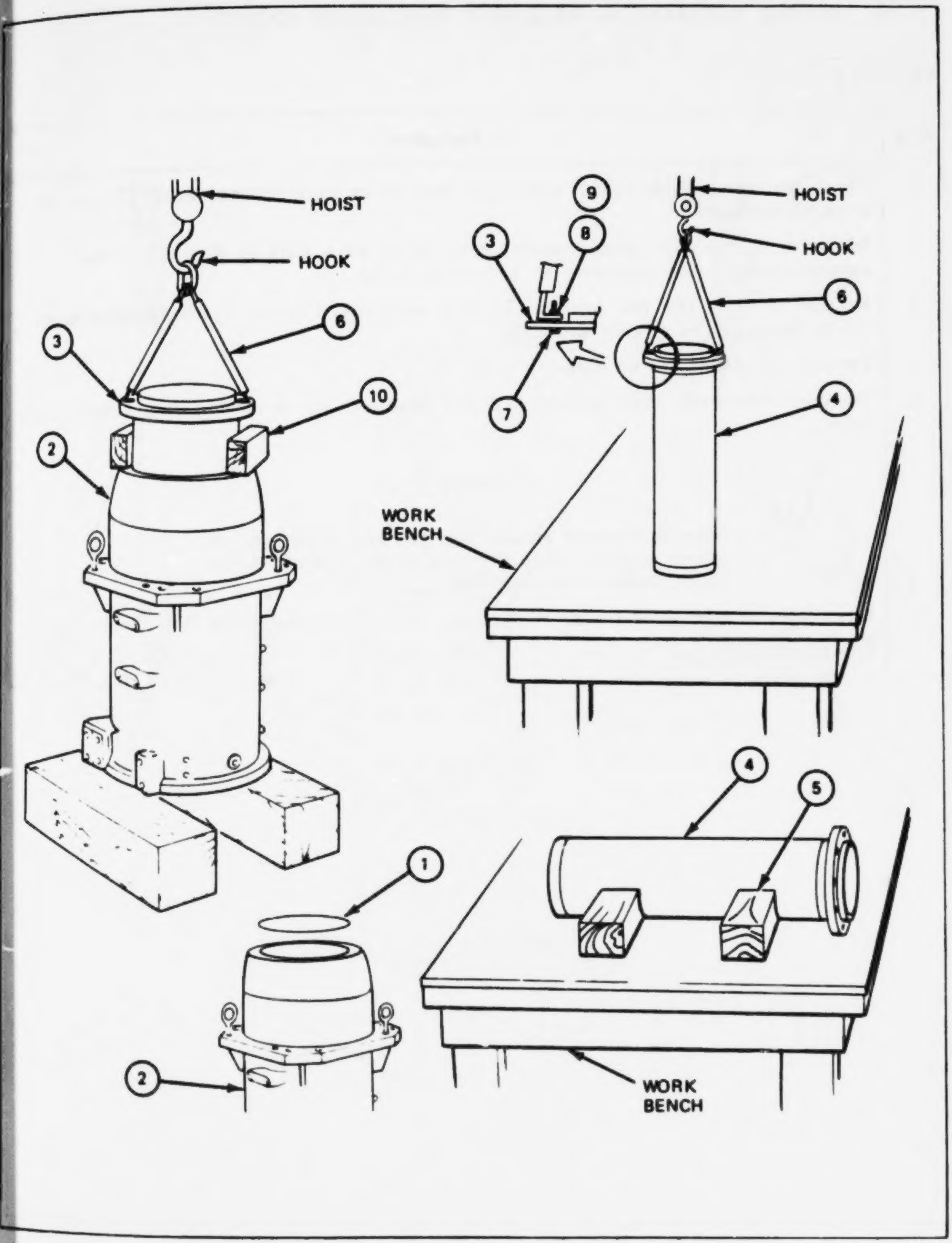
REFERENCES: JPG for procedures to:
Use torque wrench
Install lockwire
Use retaining ring pliers

PRELIMINARY PROCEDURES: Inspect recoil mechanism parts (para 11-13)

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 1

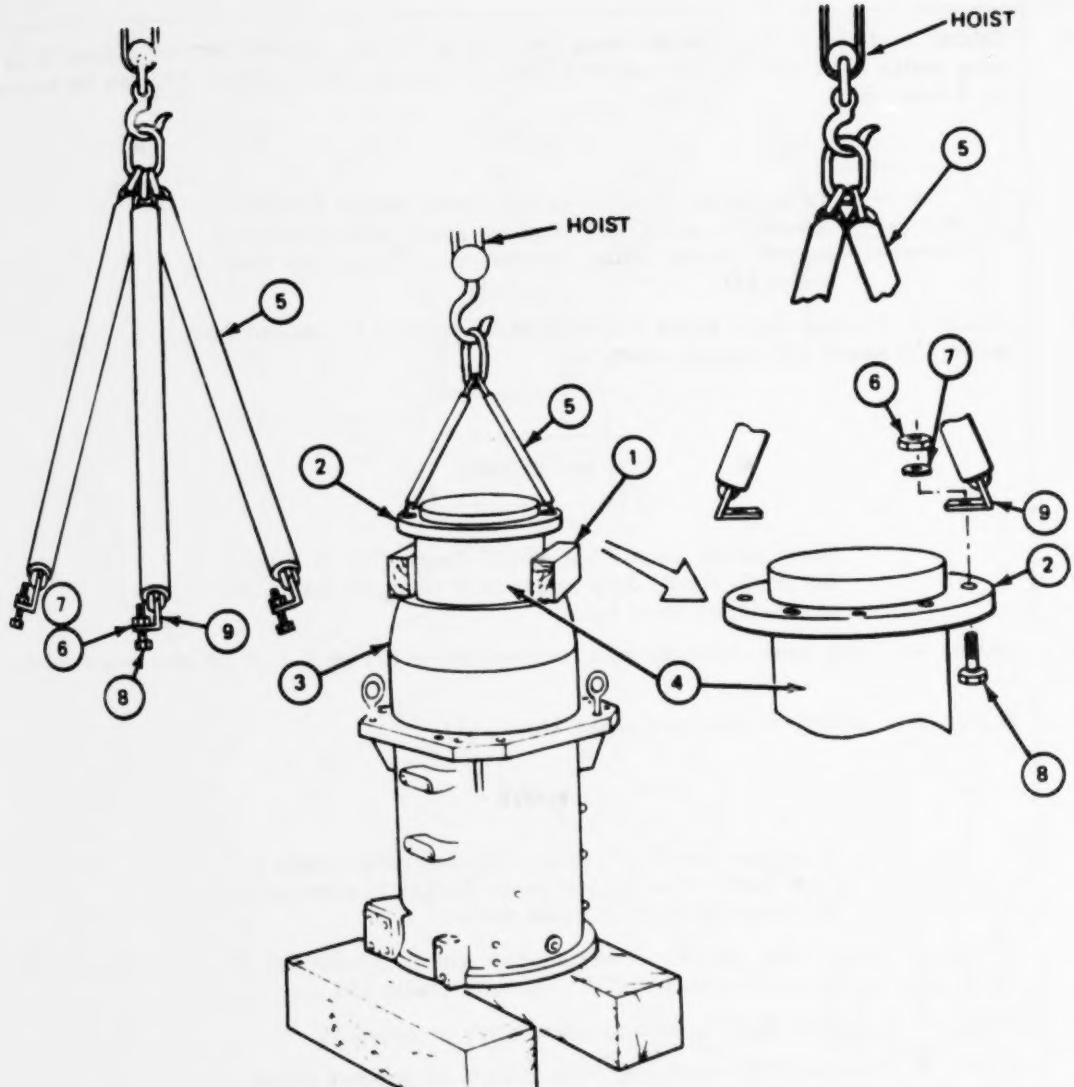
Step	Procedure
1.	Put new seal assembly (1) in top of recoil cradle (2) that flange (3) of support sleeve (4) fits on.
2.	Put a light coating of grease on seal assembly (1).
3.	Soldiers B and C: Lift support sleeve (4) off two wood blocks (5) and stand it on work bench with flange (3) end up.
	NOTE Two legs of hoisting sling (6) must be attached to flange (3) in holes diagonally across (or as close as possible to 180 degrees apart) to give proper balance when support sleeve (4) is lifted.
4.	Soldier B: Hold support sleeve (4) while soldier B attaches two legs of sling (6) to flange (3) with two screws (7), two washers (8), and two nuts (9) and makes finger tight.
5.	Soldier C: Attach sling (6) to hoist hook.
	WARNING Stay clear from underneath support sleeve (4) when it is lifted and lowered. If it falls accidentally, serious injury could result.
6.	Soldier B: Guide support sleeve (4). Soldier A: Using hoist, lift support sleeve (4) off work bench, and slowly lower it into recoil cradle (2) until flange (3) is about five inches above top of recoil cradle.
7.	Soldier C: Put two (2 x 4 x 12") wood blocks (10) between bottom of flange (3) and top of recoil cradle (2).
8.	Soldier A: Using hoist, carefully lower support sleeve (4) until flange (3) rests on two wood blocks (10). GO TO FRAME 2


HOIST
HOOK
HOIST
HOOK
WORK BENCH
WORK BENCH

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 2

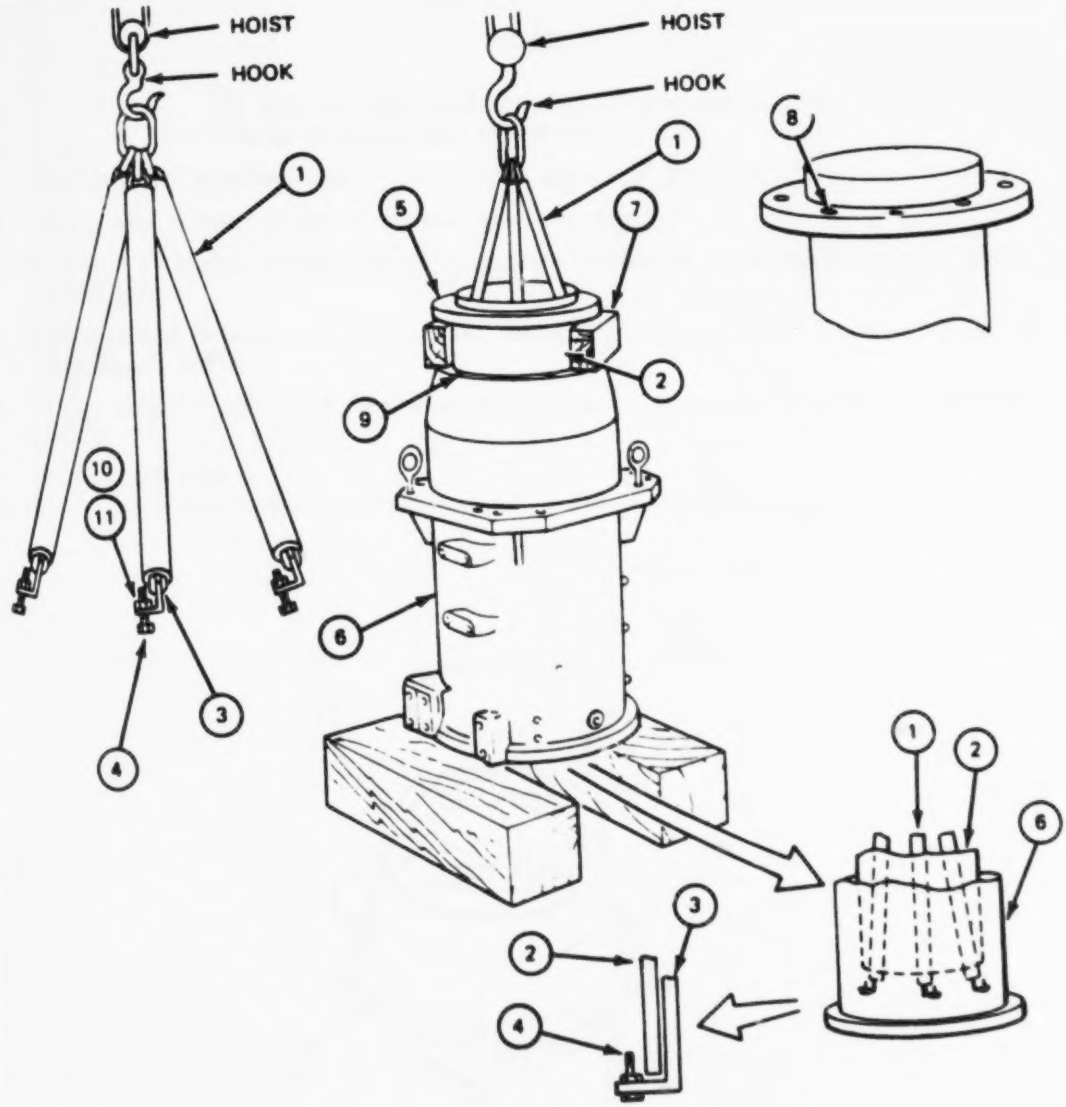
Step	Procedure
1.	Check two wood blocks (1) to make sure they are in place between flange (2) and top of recoil cradle (3)
2.	Soldier A: Using hoist, lower support sleeve (4) to allow slack in sling (5) so that support sleeve is fully supported by two wood blocks (1).
3.	Remove two nuts (6), two washers (7), and two screws (8) that attach two sling hooks (9) to flange (2) of support sleeve (4).
4.	Put one more sling (5) on hoist.
5.	Put three screws (8), three washers (7), and three nuts (6) in hooks (9) and make finger tight.
	NOTE Tape is wrapped around nuts (6) and screws (8) to protect support sleeve (4) from being scratched when sling (5) is lowered inside of it.
6.	Wrap layer of tape around each of three nuts (6) and screws (8) of three hooks (9). GO TO FRAME 3


HOIST
HOIST
HOIST

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Soldier A: Using hoist, carefully lower hoist sling (1) into support sleeve (2) until three sling hooks (3) come out just below bottom of support sleeve where they can be reached by Soldier B.
	NOTE Three hooks (3) must be positioned around bottom of sleeve (2) about 120 degrees apart with bottom of support sleeve resting between three hooks and three screws (4).
2.	Soldier B: Position three hooks (3), with three screws (4), around bottom of support sleeve (2) about 120 degrees apart.
	WARNING Keep hands away from under flange (5). If support sleeve (2) should drop accidentally on recoil cradle (6), serious injury could result.
3.	Soldier A: Using hoist, carefully raise support sleeve (2) until it is off two wood blocks (7).
4.	Soldier B: Carefully remove two wood blocks (7).
	NOTE As support sleeve (2) is lowered into recoil cradle (6), screw holes (8) in support sleeve flange (5) must line up with screw holes (9) in recoil cradle.
5.	Soldier A: Using hoist, carefully lower support sleeve (2). Soldier B: Guide support sleeve (2) to line up holes (8) with holes (9) in recoil cradle (6).
6.	Soldier A: Carefully lower hoist and allow slack in sling (1).
7.	Soldier B: Remove three hooks (3) from bottom of support sleeve (2).
8.	Soldier A: Using hoist, lift sling (1) out of support sleeve (2).
9.	Remove sling (1) from hook.
10.	Remove three nuts (10), three washers (11) and three screws (4) from three hooks (3).
	GO TO FRAME 4


HOIST
HOOK
HOIST
HOOK

[illegible]

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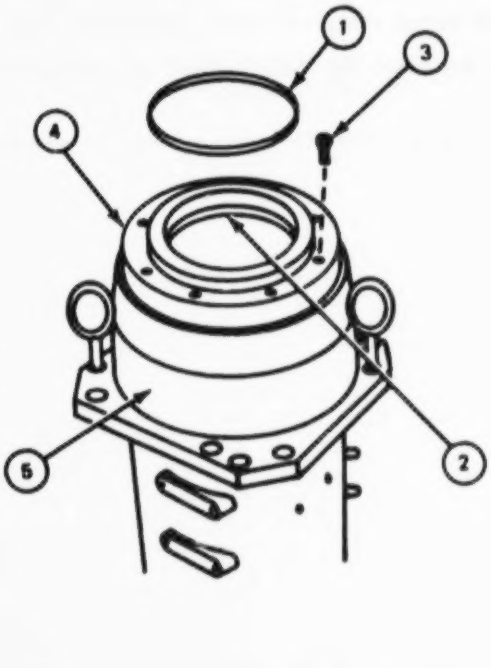
11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 4

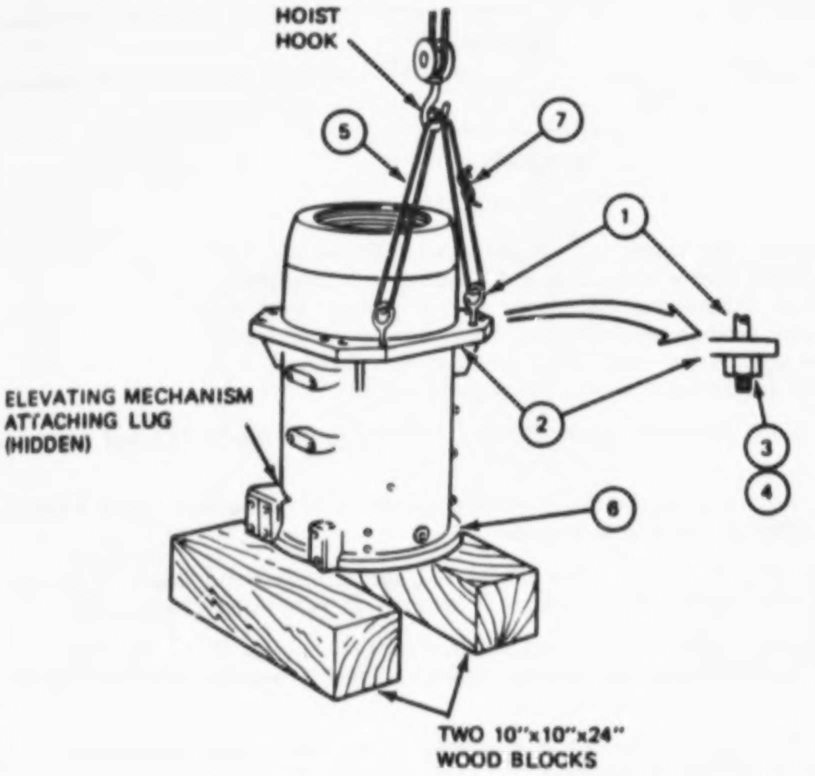
Step	Procedure
	NOTE Do step 1 if seal quadrant ring (1) was removed for damage or replacement of gun tube.
1.	Put new seal quadrant ring (1) into inside groove of sleeve (2).
2.	Put a light coating of grease on seal quadrant ring (1).
3.	Using 5/8" socket wrench, put eight screws (3) through sleeve flange (4) into recoil cradle (5).
4.	Using torque wrench with 5/8" socket, torque eight screws (3) to between 50 and 70 foot-pounds (JPG).
5.	Using diagonal pliers and long nose pliers, lockwire each pair of screws (3) together (JPG).
	GO TO FRAME 5



11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 5

Step	Procedure
	NOTE Two eyebolts (1) must be located in adjacent corners of flange (2) that are opposite of elevating mechanism attaching lug (hidden). If eyebolts are in diagonal corners of flange or not installed, do Step 1. Otherwise, go to Step 2.
1.	Using 15/16" combination wrench attach two eyebolts (1) in adjacent corners of flange (2), opposite elevating mechanism attach lug (hidden), with two washers (3) and two nuts (4).
	NOTE When fastening rope (5) to two eyebolts (1), cross rope over itself so that crossed rope in hoist hook will prevent recoil mechanism (6) from slipping sideways during lifting operation.
2.	Pass one end of rope (5) through two eyebolts (1).
3.	Cross rope (5) over itself before tying two ends with square knot (7).
4.	Put rope cross into hoist hook so that hook is lined up parallel with two eyebolts (1).
	GO TO FRAME 6

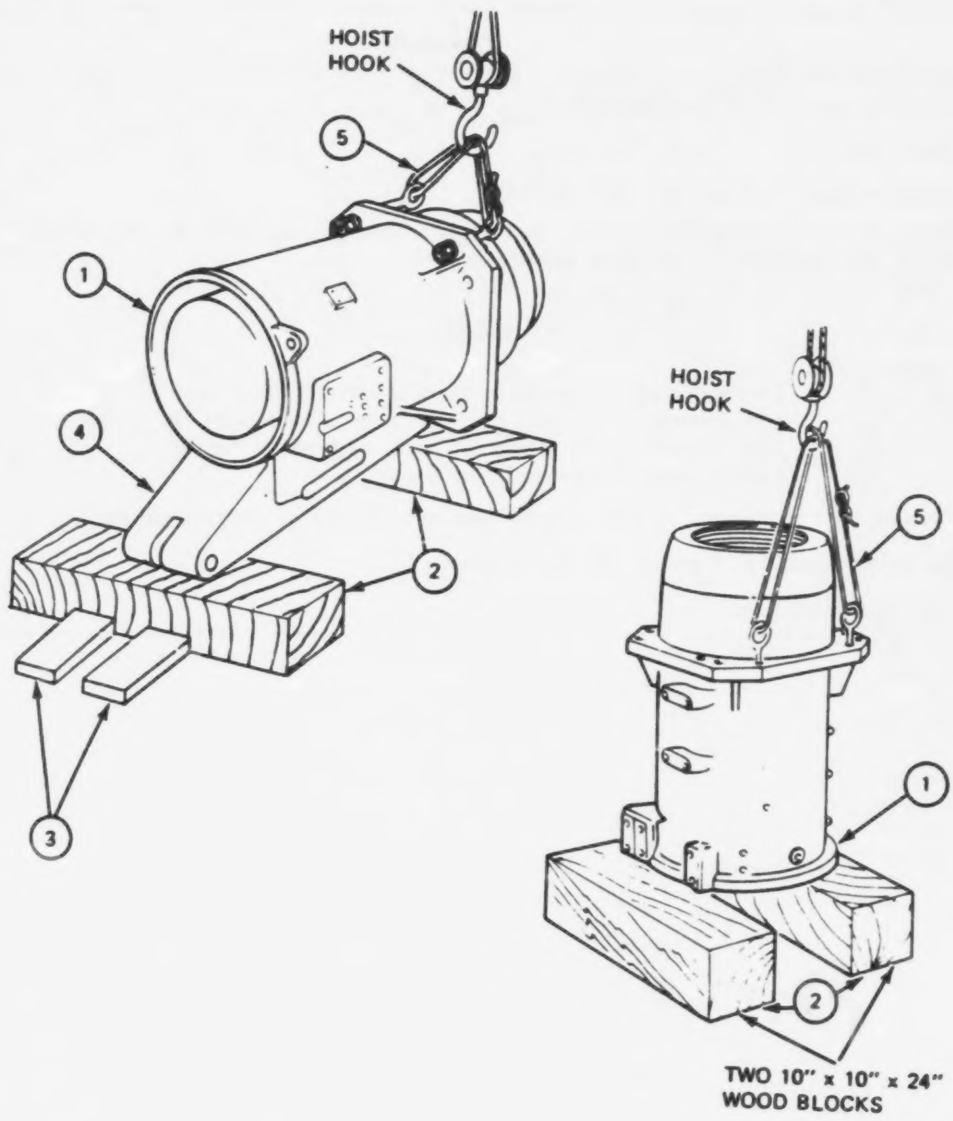

HOIST HOOK
ELEVATING MECHANISM ATTACHING LUG (HIDDEN)
TWO 10"x10"x24" WOOD BLOCKS

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 6

Step	Procedure
	WARNING Recoil mechanism (1) weighs about 900 pounds. Use extreme care when raising and handling it. When raising recoil mechanism off blocks (2) in upright position, recoil mechanism will swing back. Stay clear and stay out from under recoil mechanism when it is lifted. If it falls accidentally, serious injury could result.
1.	Soldier A: Using hoist, lift recoil mechanism (1) off two wood blocks (2) and move it to one side.
2.	Soldier C: Move two wood blocks (2) to new positions so as to support recoil mechanism (1) when it is lowered in horizontal position.
3.	Soldier B: Put two (4 x 4 x 12") wood blocks (3) against one wood block (2) at right angles to protect recoil mechanism (1) as it is lowered to two wood blocks (2).
4.	Soldier A: Using hoist, slowly lower recoil mechanism (1). Soldier B: Guide recoil mechanism (1) so that elevating mechanism attaching lug (4) touches two wood blocks (3).
5.	Soldier C: Move two wood blocks (2) as necessary to be under recoil mechanism (1) when it is lowered to horizontal position.
6.	Soldier A: Using hoist, continue to lower recoil mechanism (1) to horizontal position so that it rests on two wood blocks (2).
7.	Soldier B: Remove two wood blocks (3).
8.	Soldier A: Lower hoist to allow slack in rope (5).
	GO TO FRAME 7

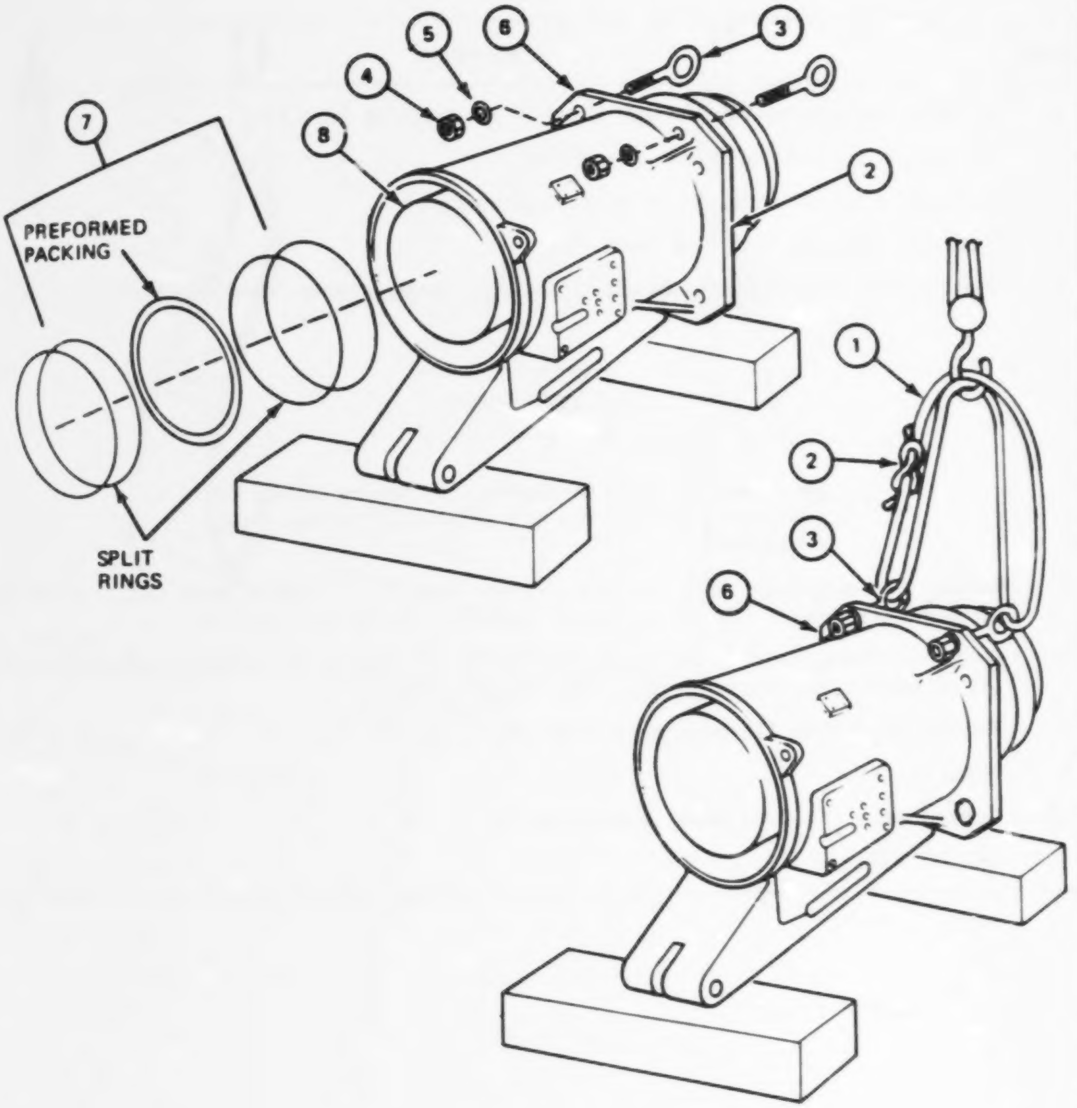
Para 11-18 Cont


HOIST HOOK
HOIST HOOK
TWO 10" x 10" x 24" WOOD BLOCKS

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 7

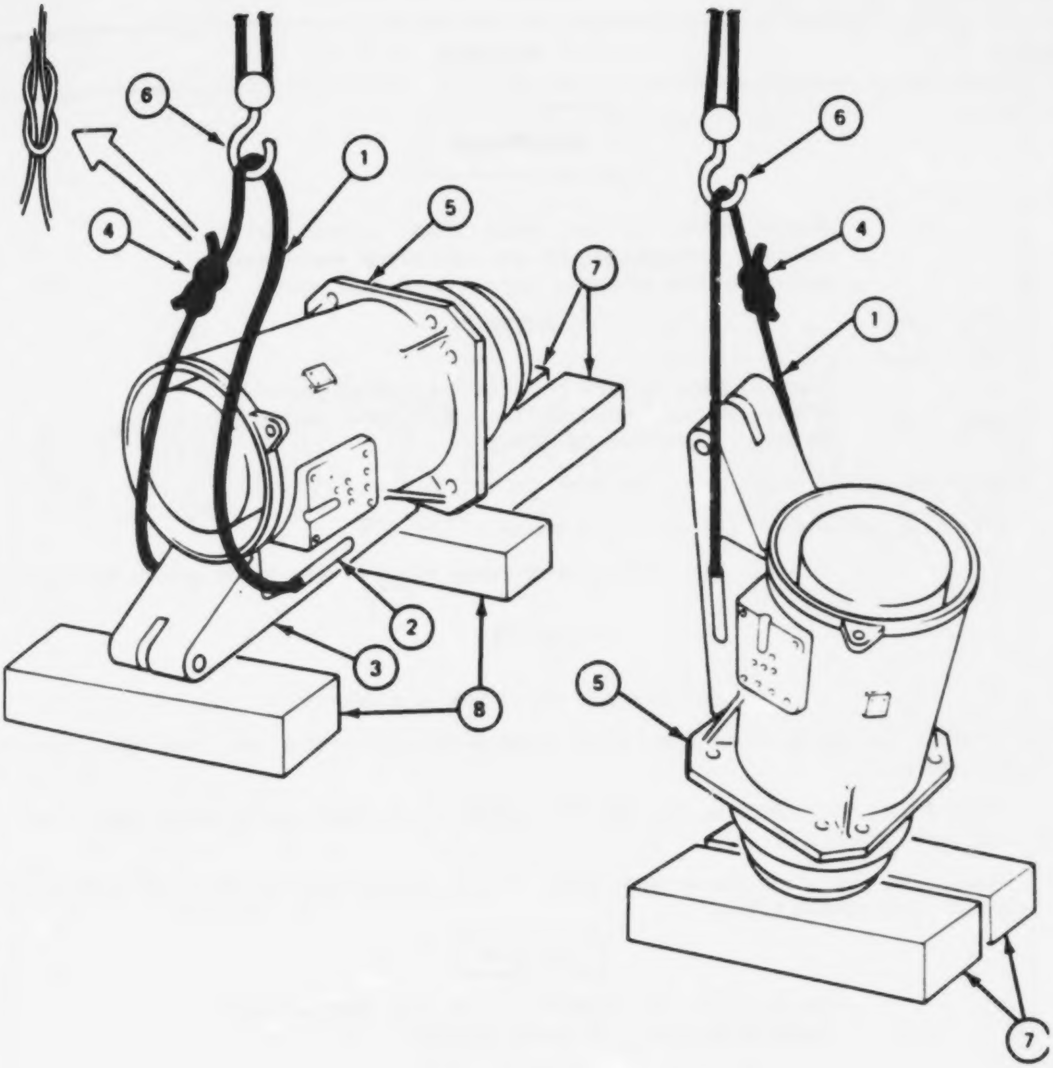
Step	Procedure
1.	Remove rope (1) from hoist hook.
2.	Untie knot (2).
3.	Remove rope (1) from two eyebolts (3).
4.	Using 15/16" combination wrench, remove two nuts (4) and two flat washers (5) that attach two eyebolts (3) to recoil mechanism (6). **NOTE** Two split rings are on each side of preformed packing of seal assembly (7). Splits of rings on same side must be 180 degrees apart. Splits of four rings must be 90 degrees apart. No two splits in line.
5.	Put new seal assembly (7) into outside groove near end of support sleeve.
6.	Put a light coating of grease on seal assembly (7).
	GO TO FRAME 8


PREFORMED PACKING
SPLIT RINGS

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 8

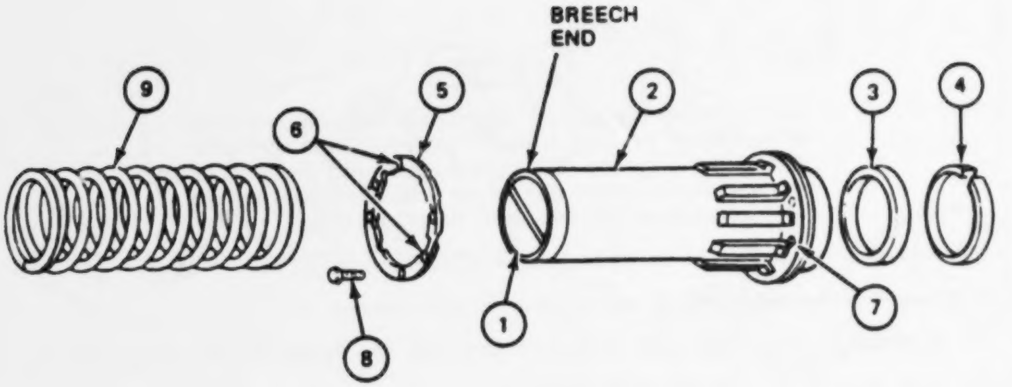
Step	Procedure
1.	Put one end of rope (1) through slots (2) of attaching lug (3).
2.	Tie square knot (4) to make a rope sling (1).
3.	Put rope sling (1) over end of recoil mechanism (5).
4.	Put rope sling (1) over hoist hook (6).
5.	Put two 4 x 4 x 24'' wood blocks (7) at right angle against wood block (8).
	WARNING Stay clear of recoil mechanism (5) during lifting and lowering operations. If it falls accidentally, serious injury could result.
6.	Soldier A: Using hoist, take up slack in rope sling (1) to tighten knob (4), then carefull lift recoil mechanism (5) off two wood blocks (8) to upright position.
7.	Soldier A: Using hoist, lower recoil mechanism (5). Soldier B: Guide recoil mechanism (5) to rest on two wood blocks (7) in upright position.
8.	Remove rope sling (1) from hoist hook (6).
9.	Untie knots (4).
10.	Remove rope (1) from recoil mechanism (5).
	GO TO FRAME 9



11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 9

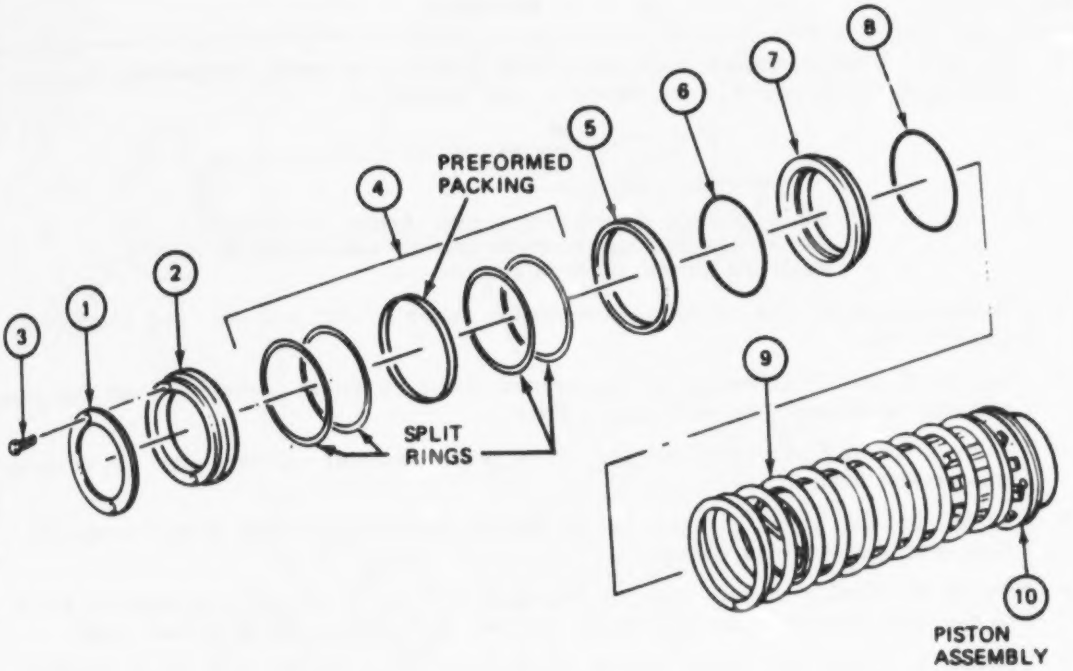
Step	Procedure
	WARNING Recoil piston (2) and recoil piston adapter are a matched machined set. Do not interchange recoil piston with parts from other sets. Serious injury may result. **NOTE** Have all parts on work bench before starting procedure. If screw thread protector (1) is not on recoil piston (2), do Step 1. Otherwise, go to Step 2.
1.	Put screw thread protector (1) on recoil piston (2).
2.	Put recoil inertia valve (3) into recoil piston (2).
3.	Using external retaining ring pliers, put retaining ring (4) into inside groove near end of recoil piston (2) (JPG). **NOTE** Go to Step 5 if recoil ring is installed.
4.	Carefully put spring recoil ring (5) on recoil piston (2) so that two dowel pins (6) fit in two holes (7).
5.	Using 3/16" Allen wrench, put four new screws (8) through spring recoil ring (5) and into recoil piston (2).
6.	Using 3/16" hex head socket and torque wrench, torque four screws (8) to between 13 and 15 foot-pounds (JPG). **CAUTION** Recoil piston (2) scratches easily. Use extreme care when putting spring (9) on recoil piston. **NOTE** If spring (9) was determined to be serviceable, install spring so that end of spring showing most wear is located at breech end of gun mount. Generally, the end coils of spring are etched "BE" for breech end and "ME" for muzzle end.
7.	Soldiers B and C: Carefully put spring (9) on recoil piston (2). GO TO FRAME 10


BREECH END

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 10

Step	Procedure
1.	Using screwdriver, attach spacer (1) to retaining cover (2) with six screws (3).
2.	Using screwdriver and torque wrench, torque six screws (3) to 5 to 7 foot-pounds (JPG).
3.	Put a light coating of grease on all surfaces of new seal assemblies. **CAUTION** Seal assembly is made up of two split rings on each side of preformed packing. Install the rings so that the splits of adjacent rings are 180 degrees apart, and the splits of the two rings on each side of the preformed packing are 90 degrees apart. No two splits should be in line.
4.	Put new seal assembly (4) in inner groove of seal retainer (5).
5.	Put new seal assembly (6) in end groove of seal retainer (5).
6.	Put assembled seal retainer (5) with seal assembly (6) facing inside spring seat (7).
7.	Put new seal (8) in groove of spring seat (7).
8.	Line up spring seat (7) containing seal retainer (5) with spring (9) and piston (10).
	GO TO FRAME 11

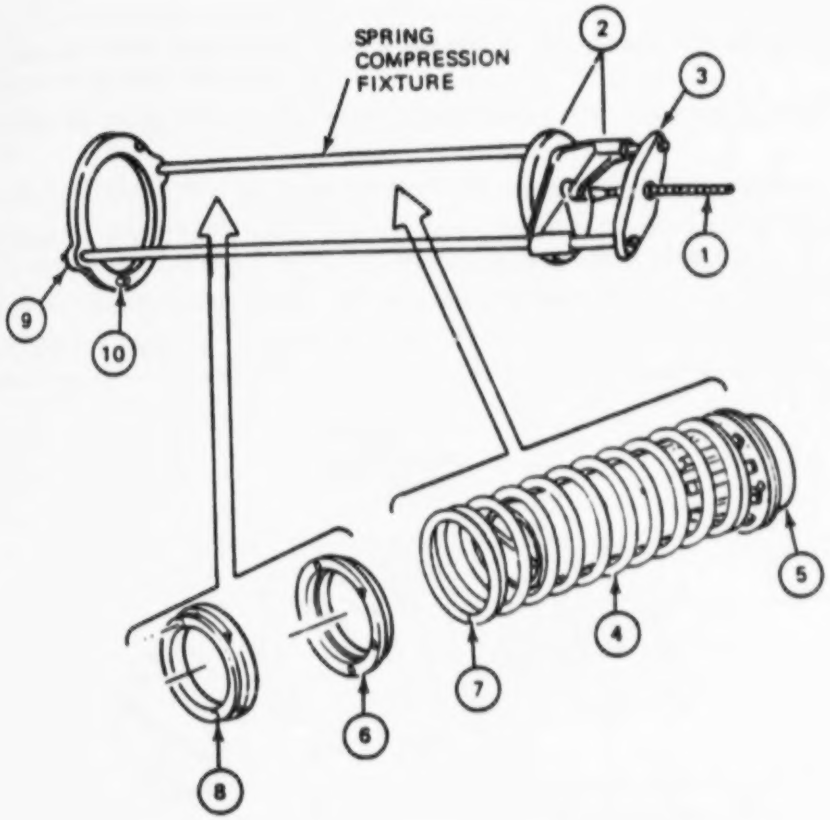


PREFORMED PACKING
SPLIT RINGS
PISTON ASSEMBLY

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 11

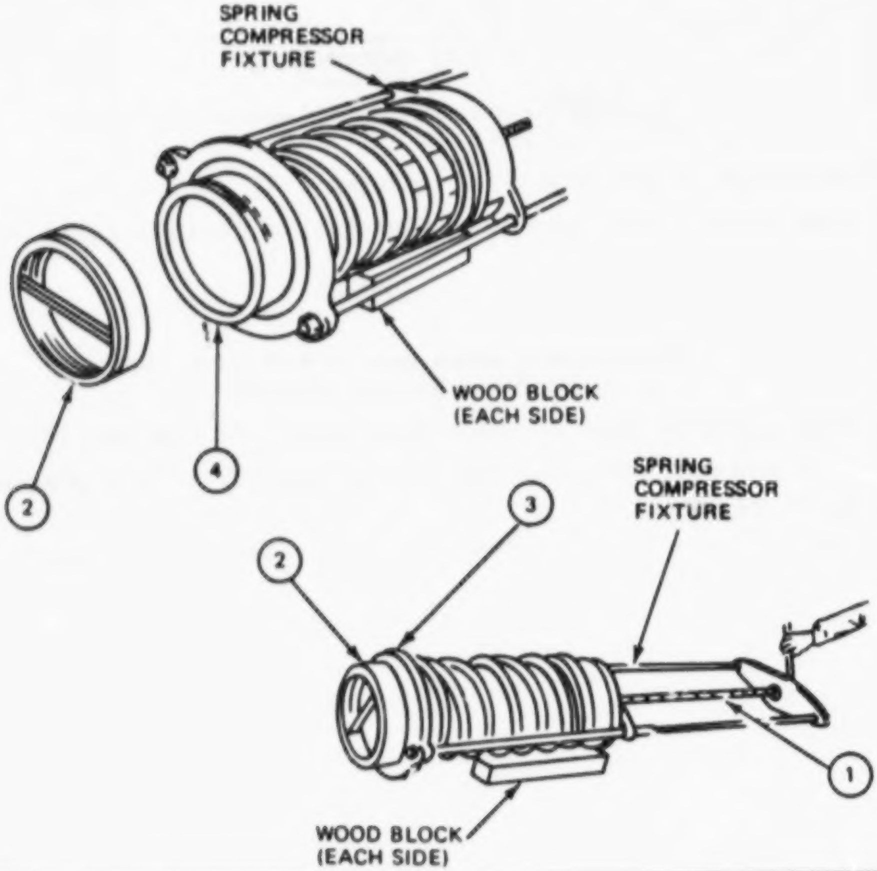
Step	Procedure
1.	Using 5/8" socket wrench, turn end of jack screw (1) on spring compression fixture so that plate and bracket (2) are moved to end bracket (3). **CAUTION** When placing spring compression fixture on piston assembly (4), use care to avoid scratches and damage to machined surfaces of piston assembly (4).
2.	Soldiers B and C: Lift up spring compression fixture so that it is over and above piston assembly (4).
3.	Soldiers B and C: Lower spring compression fixture on piston assembly (4) so that piston assembly is inside spring compression fixture.
4.	Soldiers B and C: Carefully put end (5) of piston assembly (4) over plate (2) of spring compression fixture.
5.	Soldier B: Hold piston assembly (4) in place in spring compression fixture. Soldier C: Place spring seat (6) in spring (7).
6.	Soldier B: Position retainer cover (8) on retainer plate (9) of spring compression fixture so that two holes in retainer cover go over two dowel pins (10) in retainer plate.
7.	Soldier C: Using 5/8" socket wrench, slowly turn jack screw (1) until piston assembly and parts move near retainer cover (8).
8.	Soldier B: Line up notch in spring seat (6) with notch in retainer cover (8) and makes sure two holes in spring seat go over two dowel pins (10) of retainer plate (9). GO TO FRAME 12


SPRING COMPRESSION FIXTURE

18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

AME 12

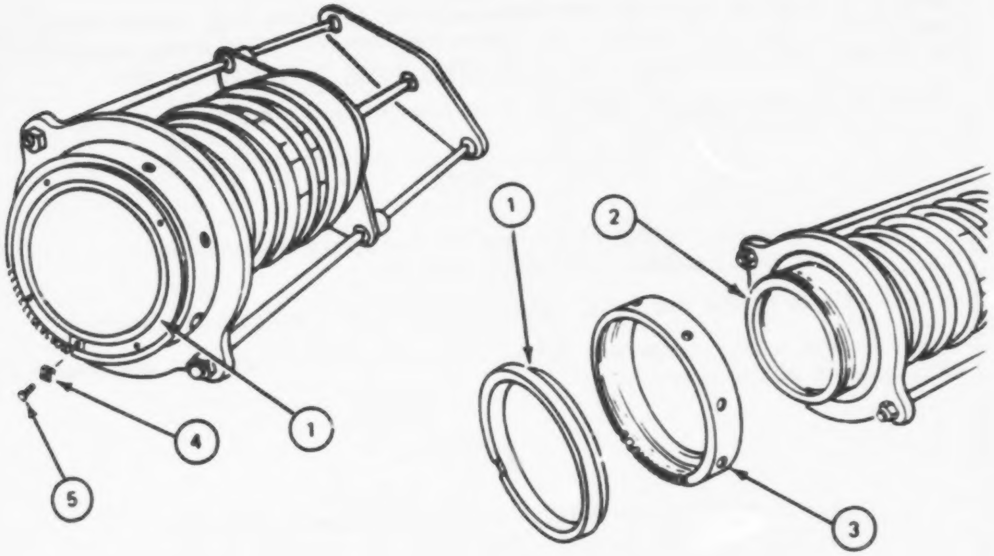
ep	Procedure
	Soldier B: Place two 6 x 6 x 18" wood blocks under each side of spring compressor fixture to prevent movement.
	Soldier C: Using 5/8" socket wrench, continue to turn jackscrew (1) until a resistance is felt.
	Soldier B: Check that all parts are lined up properly to prevent damage.
	Soldier C: Using 5/8" socket wrench, turn jackscrew (1) until all of thread protector tool (2) sticks out of spring compressor fixture spring retainer plate (3).
	Remove thread protector tool (2) from recoil piston (4).
	GO TO FRAME 13


SPRING COMPRESSOR FIXTURE
WOOD BLOCK (EACH SIDE)
2
4
3
2
SPRING COMPRESSOR FIXTURE
1
WOOD BLOCK (EACH SIDE)

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 13

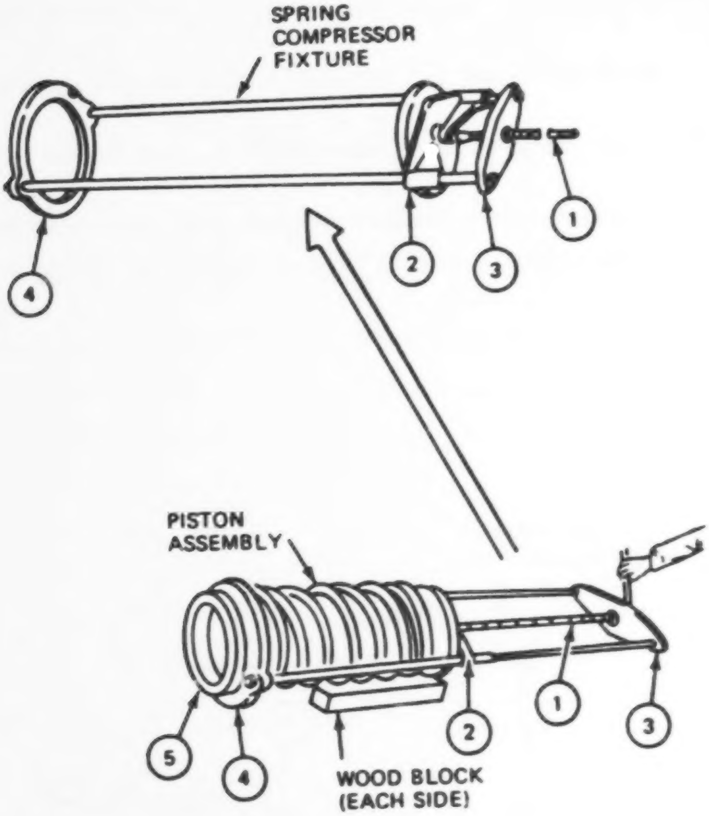
Step	Procedure
	WARNING Recoil piston adapter (1) and recoil piston (2) are a matched machined set. Do not interchange recoil piston adapter or recoil piston with parts from other sets as serious injury may result.
1.	Check recoil piston adapter (1) part number on innerface.
2.	Check recoil piston (2) part number in spline of piston.
	CAUTION Be careful not to damage threads when putting adapter collar (3) on piston (2).
3.	Carefully put adapter collar (3) on recoil piston (2).
4.	Using spanner wrench, screw piston adapter (1) on recoil piston (2)
	NOTE Piston adapter surface must be flush to 0.01" below piston surface before key (4) is installed.
5.	Using screwdriver, install key (4) on piston adapter (1) with screw (5).
6.	Using screwdriver and torque wrench, torque screw (5) to 5 to 7 foot-pounds (JPG).
	GO TO FRAME 14



11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 14

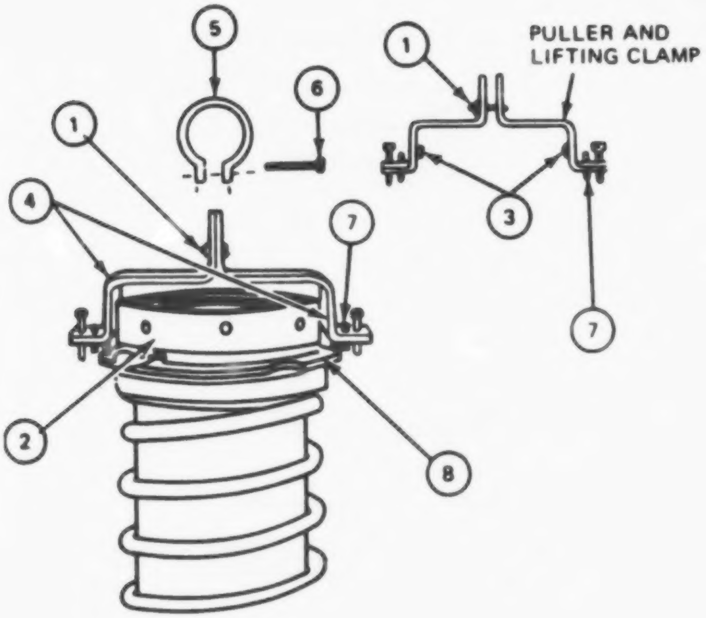
Step	Procedure
1.	Soldier B: Hold spring compressor fixture. Soldier C: Using 5/8" socket wrench, turn jackscrew (1) in the direction so that plate and bracket (2) of spring compression fixtu is moved to end bracket (3). Soldier B: Hold spring compressor fixture.
2.	Soldier B: Remove two wood blocks from sides of spring compression fixture.
	NOTE Soldiers B and C: Lift and remove spring compression fixture together from piston assembly.
3.	Soldiers B and C: Put two wood blocks (2 x 2 x 24") under piston assembly.
4.	Carefully slide spring compressor fixture at bracket (3) so that plate and bracket (2) clears end of piston assembly.
	NOTE It might be necessary to pry spring retainer plate (4) over piston adapter collar (5) to remove spring compressor fixture.
5.	Slide spring retainer plate (4) over piston adapter collar (5).
6.	Remove spring compressor fixture from piston assembly.
	GO TO FRAME 15


SPRING COMPRESSOR FIXTURE
PISTON ASSEMBLY
WOOD BLOCK (EACH SIDE)

-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

RAME 15

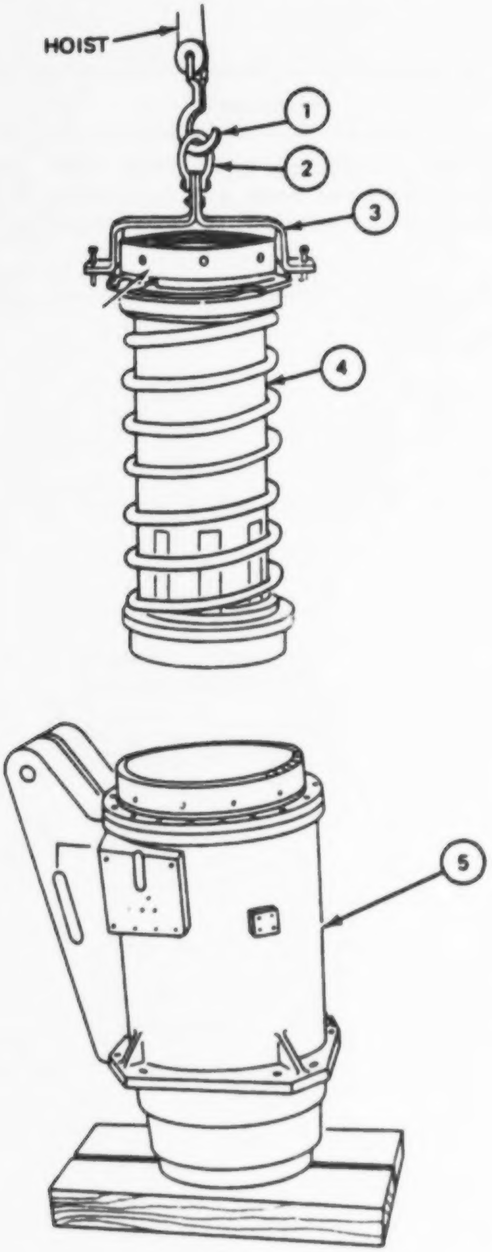
ep	Procedure
1.	Using 3/4" socket wrench and 3/4" combination wrench, loosen nut (1) of puller and lifting clamp.
2.	Put puller and lifting clamp on collar (2) so that two bosses (3) fit into two holes (4) in collar.
3.	Using 3/4" socket wrench and 3/4" combination wrench, tighten nut (1) of puller and lifting clamp.
4.	Put clevis (5) on puller and lifting clamp and tighten clevis screw (6).
5.	Using 1/4" Allen wrench, tighten two screws (7) against retainer cover (8).
	GO TO FRAME 16



11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 16

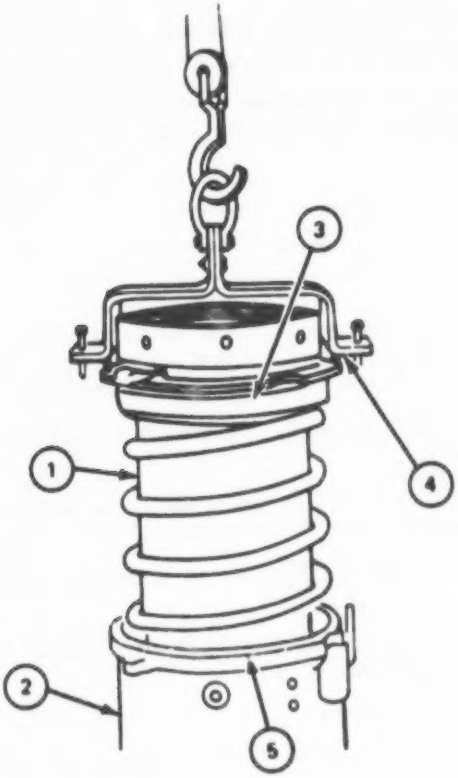
Step	Procedure
1.	Soldier A: Using hoist, put hoist hook (1) through clevis (2) attached to puller and lifting clamp (3). **WARNING** Stay clear from underneath piston assembly (4) when it is lifted from working surface and moved into position above cradle (5). Serious injury could result if piston assembly (4) should fall.
2.	Soldier B: Guide piston assembly (4).
3.	Soldier A: Using movable hoist, lift piston assembly (4) from working surface.
4.	Soldier A: Using movable hoist, place piston assembly (4) in position directly over crad (5).
	GO TO FRAME 17


HOIST

1-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

RAME 17

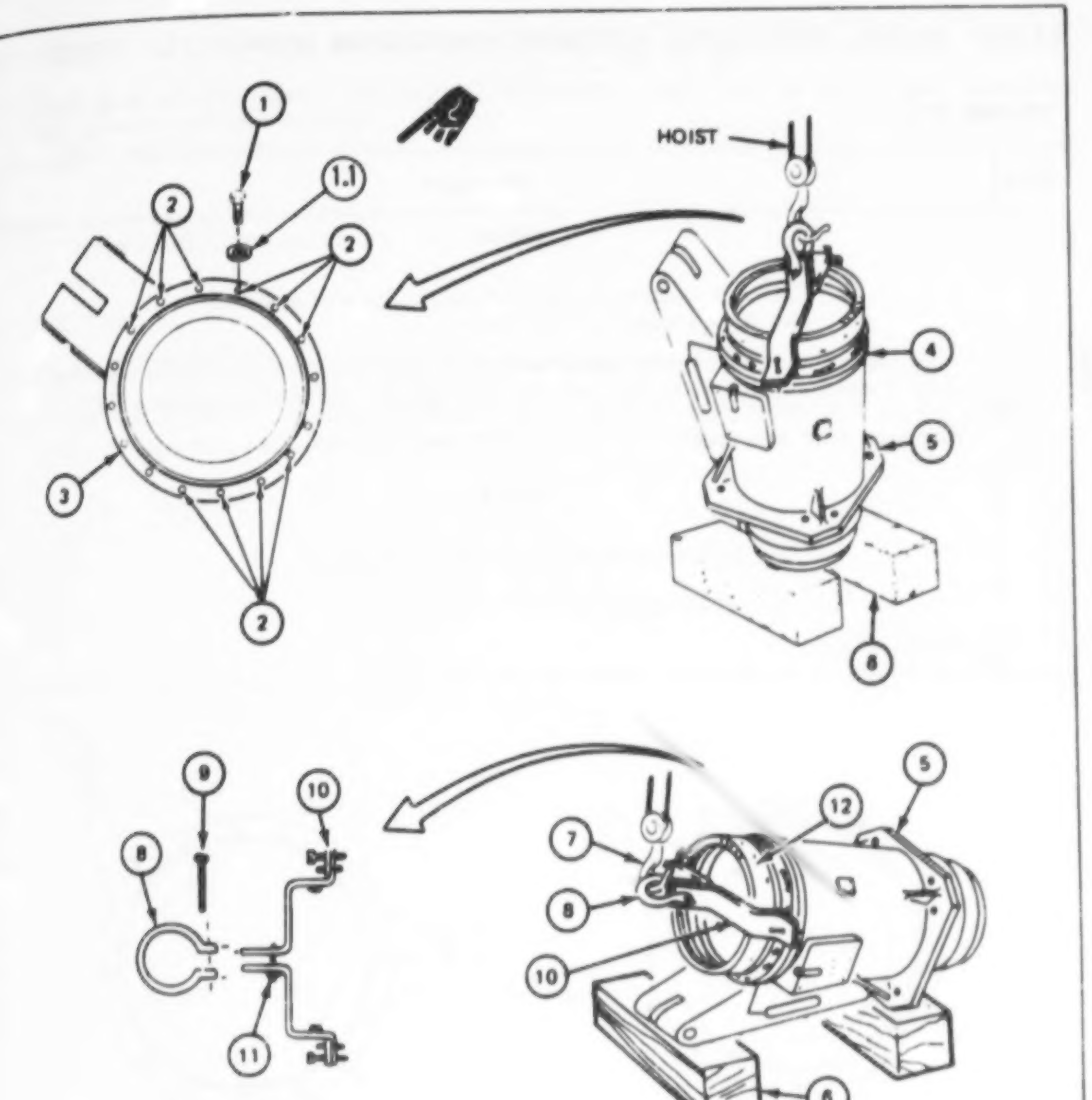
Step	Procedure
1.	Soldier A: Using movable hoist, lower piston assembly (1) into cradle (2). Soldier B: Steady piston assembly (1) and make sure screw holes (3) in spring seat and retainer cover (4) are in line with screw holes (5) in flange of cradle (2). GO TO FRAME 18



11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 18

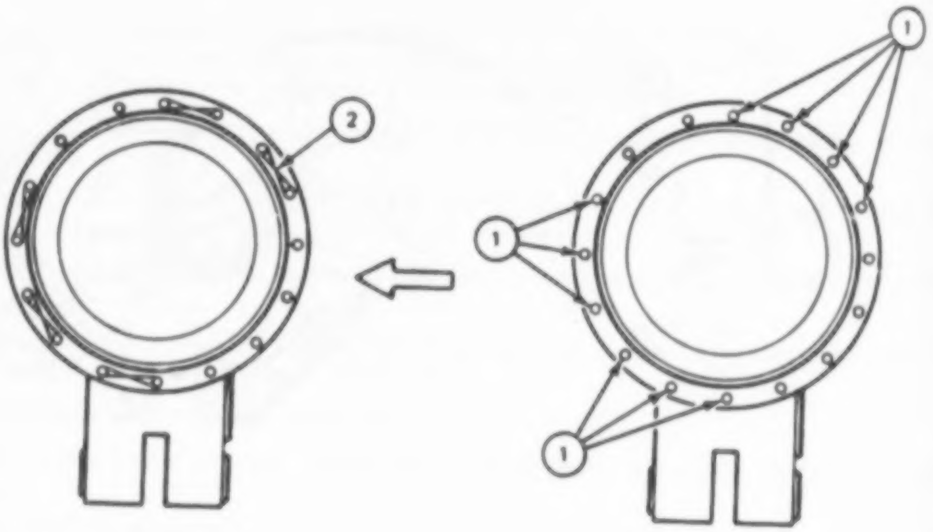
Step	Procedure
	NOTE New screws (1) must be used to fasten retainer cover (3) of piston assembly to cradle (4). There are sixteen screw holes (2), but only the ten shown will be used at this time. Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
1.	Using socket wrench, put ten new screws (1) and ten new flat washers (1.1) in ten holes (2) to hold retainer cover (3) of piston assembly to cradle (4), but do not torque screws at this time.
	WARNING Stay clear from underneath recoil mechanism (5) when it is lifted and turned to horizontal position. If it should swing or fall accidentally, serious injury could result.
2.	Soldier A: Using hoist, carefully lift recoil mechanism (5) off two wood blocks (6) and move it out of way.
3.	Soldier B: Move two wood blocks (6) to new position to support recoil mechanism (5) when it is lowered and turned to horizontal position.
4.	Soldier C: Guide recoil mechanism (5) to turn to horizontal position on two wood blocks (6).
5.	Soldier A: Using hoist, slowly lower recoil mechanism (5) until it is supported fully in horizontal position on two wood blocks (6).
6.	Remove hoist hook (7) from clevis (8).
7.	Remove clevis screw (9) that attaches clevis (8) to puller and lifting clamp (10). Remove clevis.
8.	Using 3/4" combination and 3/4" socket wrench, loosen nut (11) to release puller and lifting clamp (10) from adapter collar (12). GO TO FRAME 19


1
1.1
2
2
2
3
HOIST
4
5
6
9
10
8
11
7
12
5
8
10
6

11-18. RECOIL MECHANISM ASSEMBLY PROCEDURE (CONT)

FRAME 19

Step	Procedure
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
1.	Using torque wrench, torque ten screws (1) to between 90 and 110 foot-pounds for 1/2-in. screws and between 120 and 140 foot-pounds for 9/16-in. screws (JPG).
2.	Using long nose and diagonal pliers, lockwire each pair of screws (1) together (JPG).
	NOTE Follow-on Maintenance Action Required: Install recoil mechanism (para 11-16). END OF TASK



9. RECOIL MECHANISM REPAIR PROCEDURE

S: Upper guide plate (fabricated tool, item 23, App. B)
Drill extension and split bushing
(fabricated tool, item 22, App. B)

LIES: Dowel pins (8449259) (two)
Screws (MS 21262-44) (four)

ONNEL: One

IMINARY PROCEDURES: Inspect recoil mechanism parts (para 11-13)

RAL INSTRUCTIONS: If recoil mechanism parts are bad, order repair part or next higher assembly as required.

All data on pages 11-174 and 11-175, including frame 1, deleted.

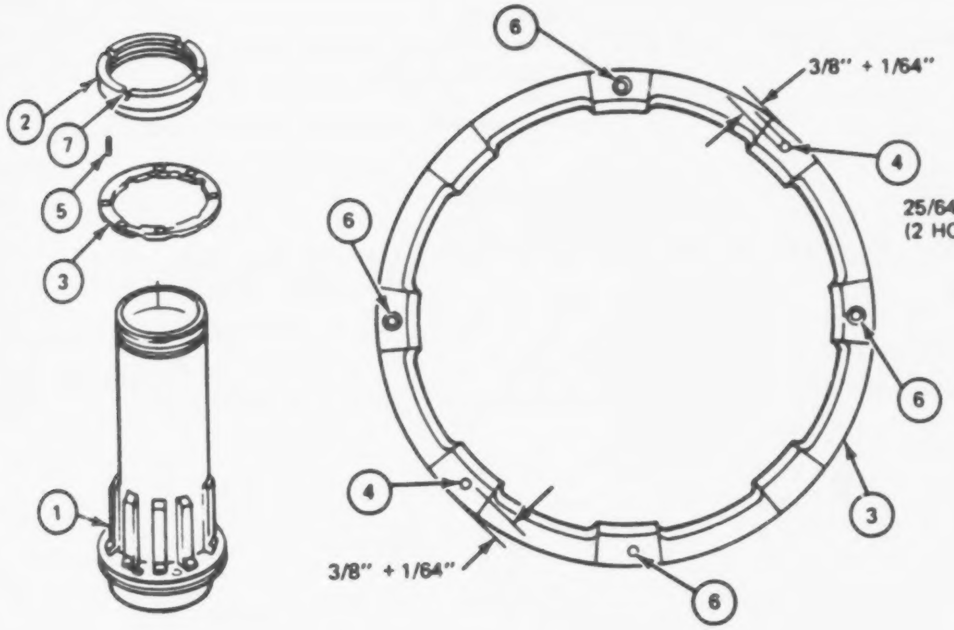
11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

b. Modification to Add Dowel Pins to Piston Assembly

FRAME 2

Step	Procedure
	SUPPORT SHOP WORK
1.	Take piston (1), matching piston adapter (2), and spring recoil ring (3) along with guide plate, drill extension, and split bushing (fabricated tools) to shop where machining equipment is available.
2.	Drill two holes (4) in spring recoil ring (3).
3.	Install spring recoil ring (3) on piston (1).
4.	Install four new screws (5) through four spring recoil ring holes (6) into piston (1).
5.	Tighten four screws (5) to between 13 and 15 foot-pounds.
6.	Screw piston adapter (2) onto piston (3) so that bottom of slots (7) are flush with top of piston (1).
	GO TO FRAME 3

Para 11-19 Cont

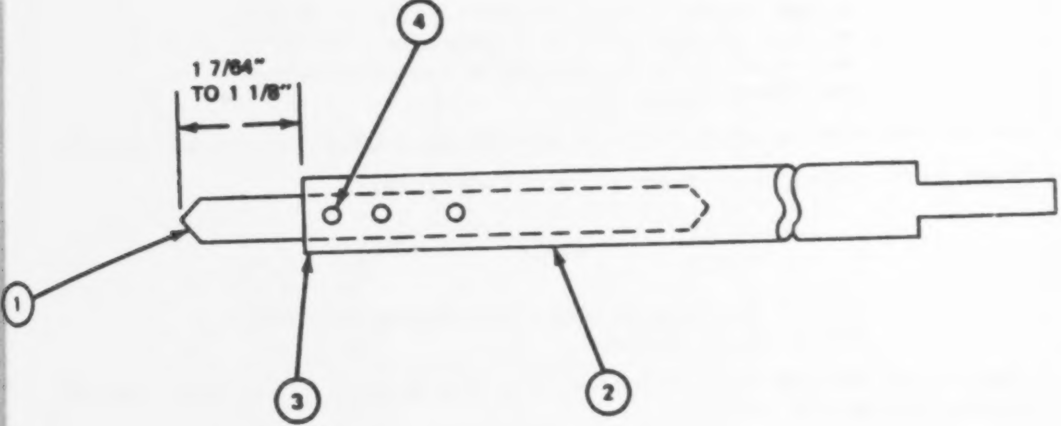

3/8" + 1/64"
25/64" DIA
(2 HOLES)
3/8" + 1/64"

11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

b. Modification to Add Dowel Pins to Piston Assembly (Cont)

FRAME 3

Step	Procedure
	SUPPORT SHOP WORK
1.	Put 25/64" drill (1) into fabricated drill extension (2). **NOTE** Drill must extend 1 - 7/64" to 1 - 1/8" from face (3) of drill extension (2).
2.	Tighten three setscrews (4). GO TO FRAME 4

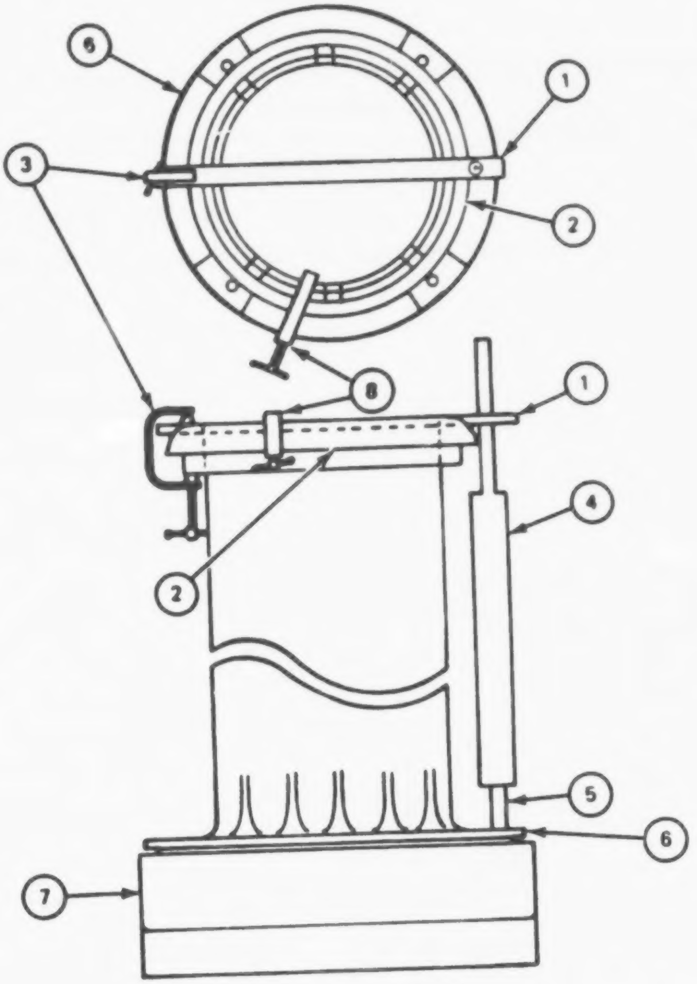


11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

b. Modification to Add Dowel Pins to Piston Assembly (Cont)

FRAME 4

Step	Procedure
	SUPPORT SHOP WORK **NOTE** When doing step 1, make sure hole in upper guide plate (1) will just clear outside edge of piston adapter (2).
1.	Put upper guide plate (1) into slots of piston adapter (2).
2.	Fasten upper guide plate (1) to piston adapter (2) with C-clamp (3).
3.	Put shank of drill extension (4) through hole in upper guide plate (1).
4.	Put drill bit (5) into right hand hole drilled in recoil spring ring (6) in frame 3.
	NOTE A slight rotation of piston adapter (2) may be necessry to make drill extension (4) perpendicular (vertical) to base of piston (7). This may require a visual check from two different angles.
5.	Line up drill extension (4) so that it is perpendicular (vertical) to base of piston (7).
6.	Fasten piston adapter (2) to piston (7) with C-clamp (8).
	NOTE In next step, lubricate drill often. Remove drill from hole to remove metal clips.
7.	Using electric drill and drill extension (4), drill hole in piston (7) to entire depth of extended drill bit (5).
8.	Remove C-clamp (8) and drill extension (4).
9.	Rotate adapter piston (2) with upper guide plate (1) so that upper guide plate hole is above left hand hole drilled in recoil spring ring (6) in frame 3.
10.	Repeat steps 3 through 7 to drill left hole in piston (7).
	GO TO FRAME 5

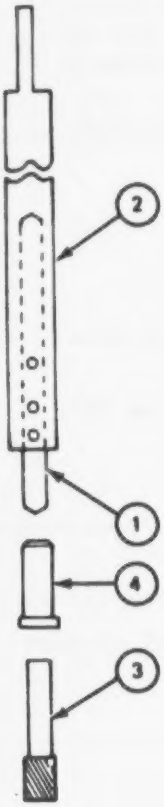


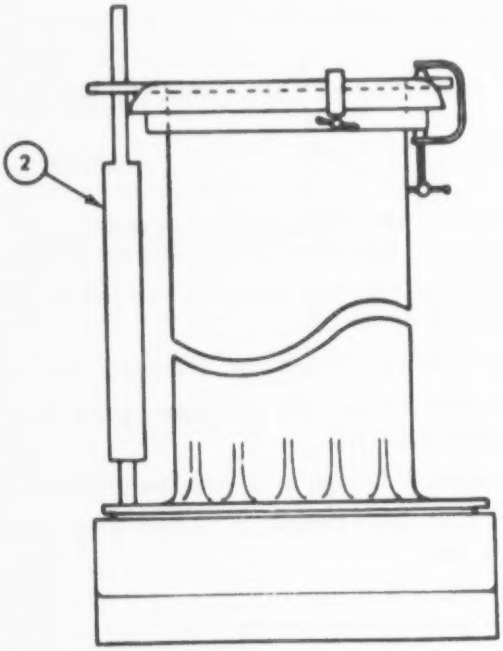
11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

b. Modification to Add Dowel Pins to Piston Assembly (Cont)

FRAME 5

Step	Procedure
	SUPPORT SHOP WORK
1.	Remove drill (1) from drill extension (2).
2.	Put 13/32" reamer (3) with split bushing (4) into drill extension (2).
	GO TO FRAME 6



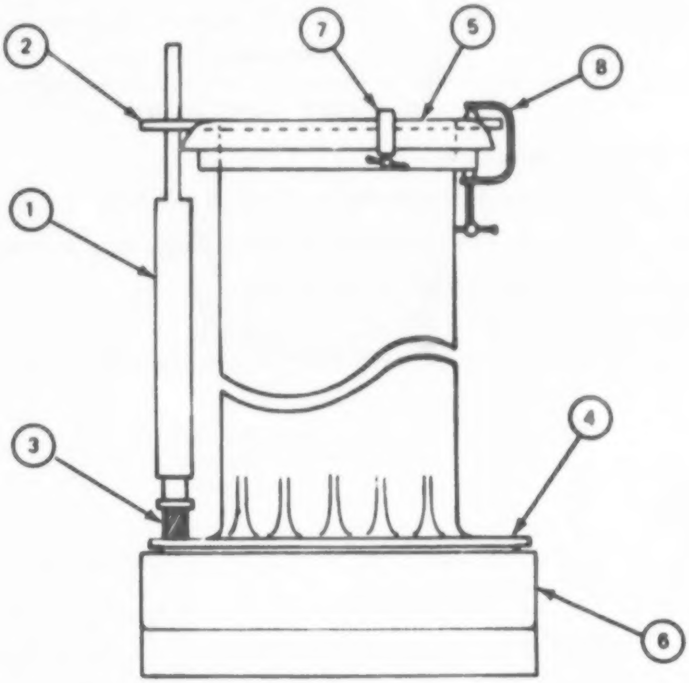


11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

b. Modification to Add Dowel Pins to Piston Assembly (Cont)

FRAME 6

Step	Procedure
	SUPPORT SHOP WORK
1.	Put shank of drill extension (1) through hole in upper guide plate (2).
2.	Put reamer bit (3) on left hand hole of recoil spring ring (4).
	NOTE A slight rotation of piston adapter (5) may be necessary to make drill extension (1) perpendicular to base of piston (6). This requires a visual check of drill extension (1) from two different angles.
3.	Rotate piston adapter (5) to align drill extension (1) so that it is perpendicular to base of piston (6).
4.	Fasten piston adapter (5) to piston (6) with C-clamp (7).
	NOTE In step 5, lubricate reamer bit (3) often. Remove burrs and chips by lifting reamer from hole.
5.	Using electric drill, drill extension (1) and reamer (3), ream out holes in recoil spring ring (4) and piston (6).
6.	Remove C-clamp (7) and drill extension (1).
7.	Rotate piston adapter (5) with upper guide plate (2) so that upper guide plate hole is above right hand hole.
8.	Repeat steps 1 through 5 to ream out holes in recoil spring ring (4) and piston (16).
9.	Remove C-clamps (7) and (8), upper guide plate (2) and drill extension (1) from piston assembly (6).
	GO TO FRAME 7

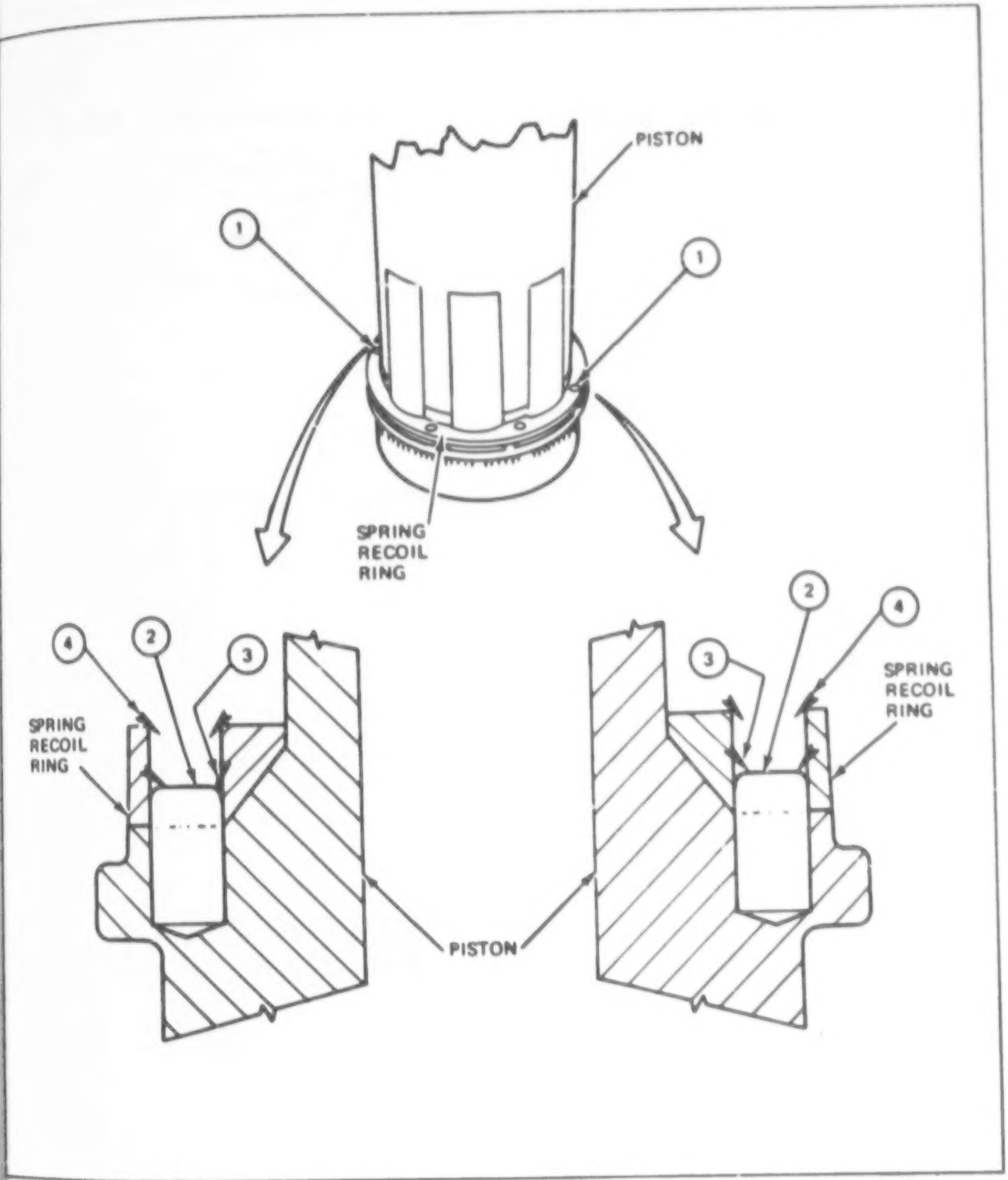


11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

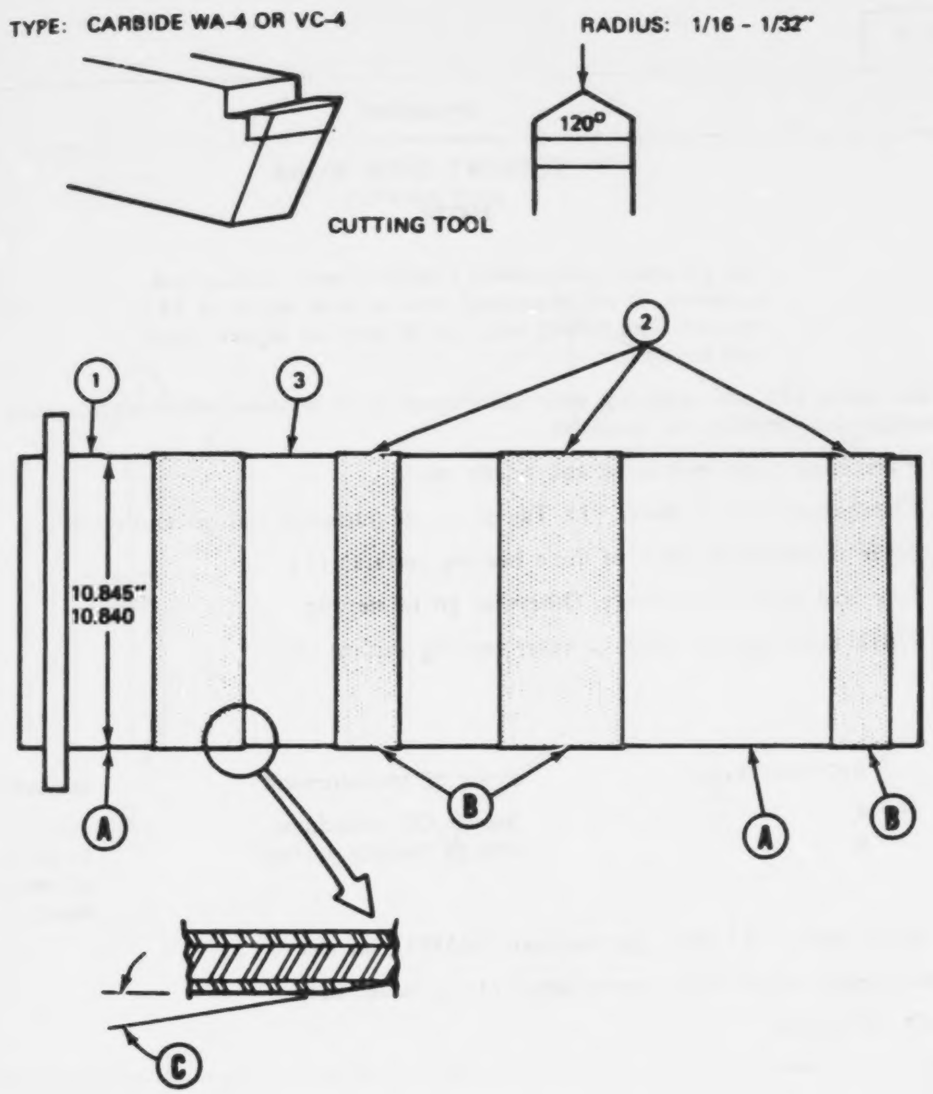
b. Modification to Add Dowel Pins to Piston Assembly (Cont)

FRAME 7

Step	Procedure
	SUPPORT SHOP WORK
1.	Clean two holes (1) thoroughly.
2.	Install and stake two dowel pins 8449259 (2) into two holes (1) at internal points (3)
3.	Stake edges of two holes (1) on surface of spring recoil ring at points (4).
4.	Return piston, with piston adapter to turret shop.
	GO TO FRAME 8


PISTON
①
①
SPRING RECOIL RING
④
②
③
SPRING RECOIL RING
③
②
④
SPRING RECOIL RING
PISTON

All data on pages 11-188 thru 11-191/(11-192 blank), including frames 8 and 9, deleted.


TYPE: CARBIDE WA-4 OR VC-4
RADIUS: 1/16 - 1/32"
120°
CUTTING TOOL
1
2
3
10.845"
10.840
A
B
A
B
C

best copy available

11-19. RECOIL MECHANISM REPAIR PROCEDURE (CONT)

d. Sleeve 11658912 Dimensional Check and Modification

FRAME 9

Step **Procedure**

SUPPORT SHOP WORK

NOTE

This procedure is for sleeve 11658912 only. Cutting tool, as shown, is recommended with a lathe speed of 147 rpm and feed 0.0036 inch. use 16 inch (or higher) lathe with steady rest.

1. Take sleeve (1) and centering plate (fabricated tool) to shop where measurement and machining equipment are available.

2. Use centering plate with lathe and steady rest.

a. Check roundness of sleeve (1). Tag if out of tolerance and go to step 3.

b. Make dimensional check of three bearing surfaces (2).

c. Turn and finish if necessary. Otherwise go to step 2e.

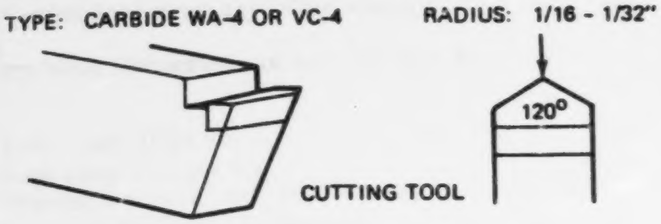
d. Check finish against finish of outer bearing surface (3).

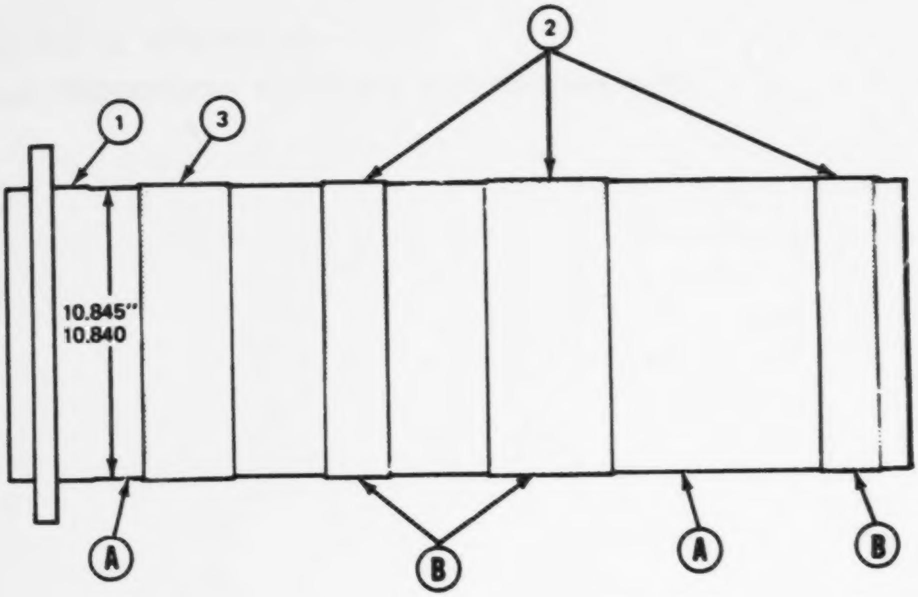
Reference Letter	Point of Measurement	Measurement
A	Sleeve OD roundness	.005
B	OD of bearing surface	10.855 to 10.86 63 microinch finish

e. Metal stamp "A" after part number 11658912 on sleeve (1).

3. After support shop work, return sleeve (1) to turret shop.

END OF TASK


TYPE: CARBIDE WA-4 OR VC-4
RADIUS: 1/16 - 1/32"
120°
CUTTING TOOL


2
1
3
10.845"
10.840
A
B
A
B

[illegible]

[illegible]

[illegible]

-20. CANNON TUBE AND BREECH RING REMOVAL PROCEDURE

OLS: Movable hoist (4 ton capacity)
Girth wrench (NSN 4933-00-775-3745)
Breech lifting tool (NSN 4933-00-775-3742)
9/16" socket head screw key (Allen wrench)
Sling
Wooden block (fabricated tool, item 18, App. B)

PPLIES: Screw (MS 90728-64)
Rags (item 21, App. A)
Wooden blocks (6" x 6" x 24") (two)
Rope (10 feet long) (1" diameter)

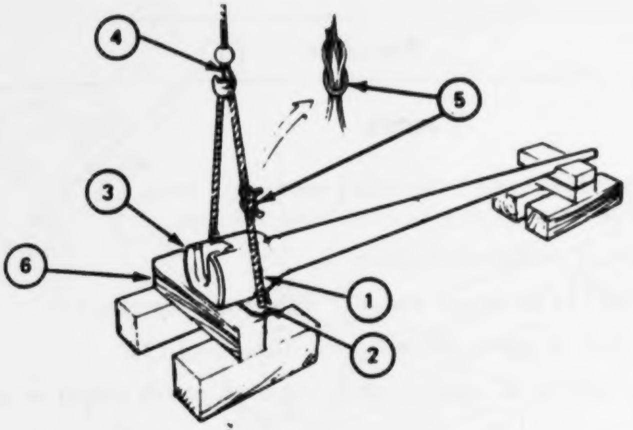
RSONNEL: Four (including hoist operator)

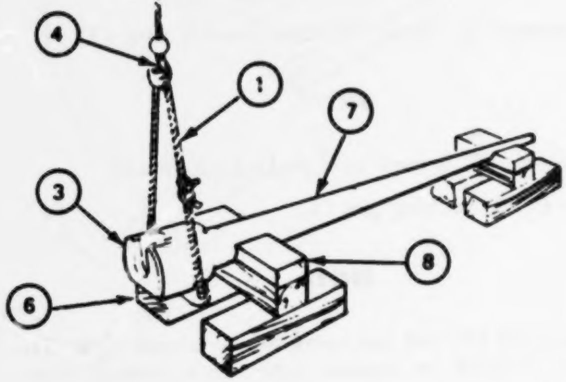
ELIMINARY PROCEDURES: Remove recoil mechanism (para 11-15)

11-20. CANNON TUBE AND BREECH RING REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	NOTE Use rags for padding to protect rope from sharp edges.
1.	Put rope (1) through two bearing holes (2) in bottom of breech ring (3).
2.	Put one end of rope (1) over hoist hook (4) and tie ends of rope (1) together with a square knot (5).
3.	Soldier A: Using hoist (4), take up slack and tighten knot(s) then carefully lift breech ring (3) off wooden blocks (6).
4.	Move wooden blocks (6) under cannon tube (7) near breech ring (3).
5.	Put wooden block (8) between cannon tube (7) and wooden blocks (6).
6.	Soldier A: Using hoist, lower cannon tube (7) into cut out of wooden block (8).
7.	Remove hoist hook (4) and rope (1). GO TO FRAME 2

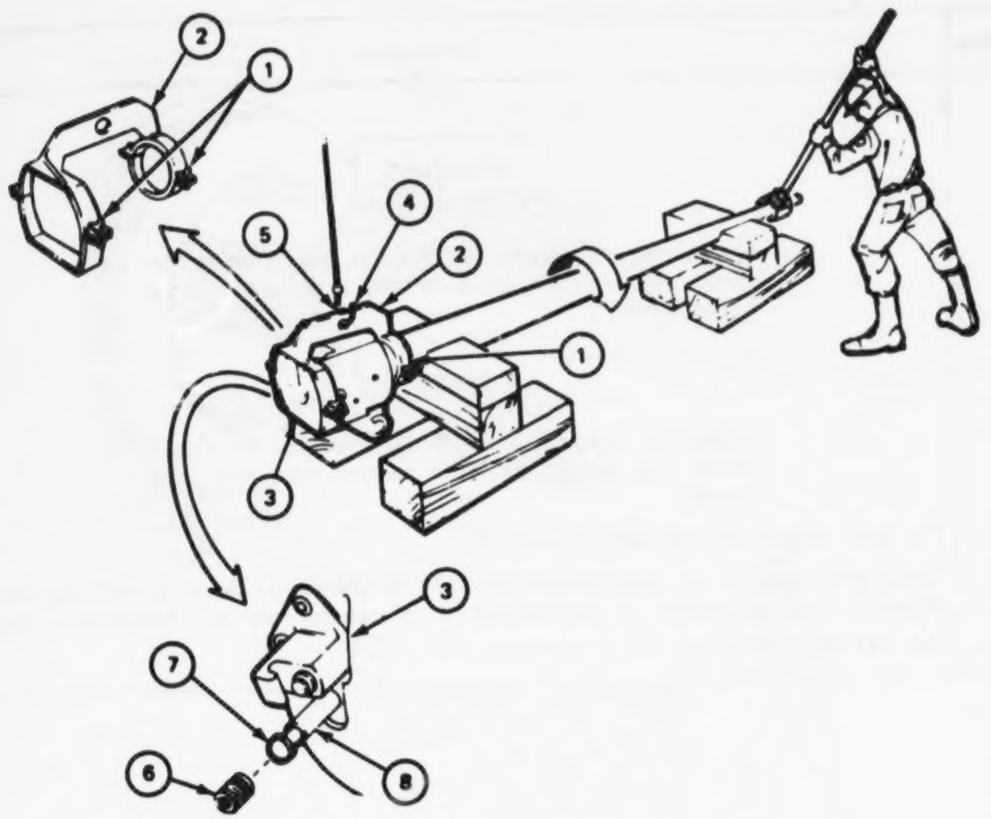




11-20. CANNON TUBE AND BREECH RING REMOVAL PROCEDURE (CONT)

FRAME 2

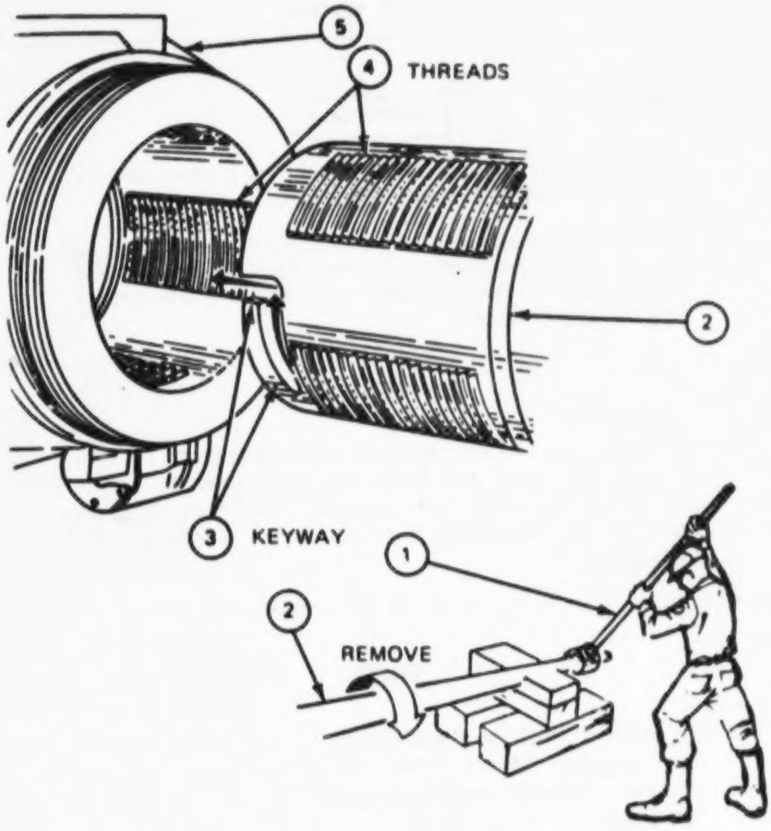
Step	Procedure
	NOTE If hole in lifting tool (2) for lifting hook is too small, use clevis with large opening to allow hook clearance.
1.	Remove two wing nuts (1) from breech lifting tool (2).
2.	Attach breech lifting tool (2) to breech ring (3) with two wing nuts (1).
3.	Put hoist hook (4) in hole or clevis (5) in breech lifting tool (2).
4.	Soldier A: Using hoist, remove all slack in sling (4). Do not lift weight of breech ring (3).
5.	Using Allen wrench, remove set screw (6) from breech ring (3).
	NOTE Screw (7) is used as a locking pin puller.
6.	Using hand, put screw (7) in locking pin (8).
	NOTE If locking pin (8) will not come out of breech ring (3), put girth wrench on cannon tube. Turn cannon tube slightly, back and forth, while pulling on locking pin until it comes out.
7.	Pull screw (7) and locking pin (8) out of breech ring (3). Do not remove screw (7) from locking pin (8).
	GO TO FRAME 3


2
1
5
4
2
1
3
3
7
8
6

11-20. CANNON TUBE AND BREECH RING REMOVAL PROCEDURE (CONT)

FRAME 3

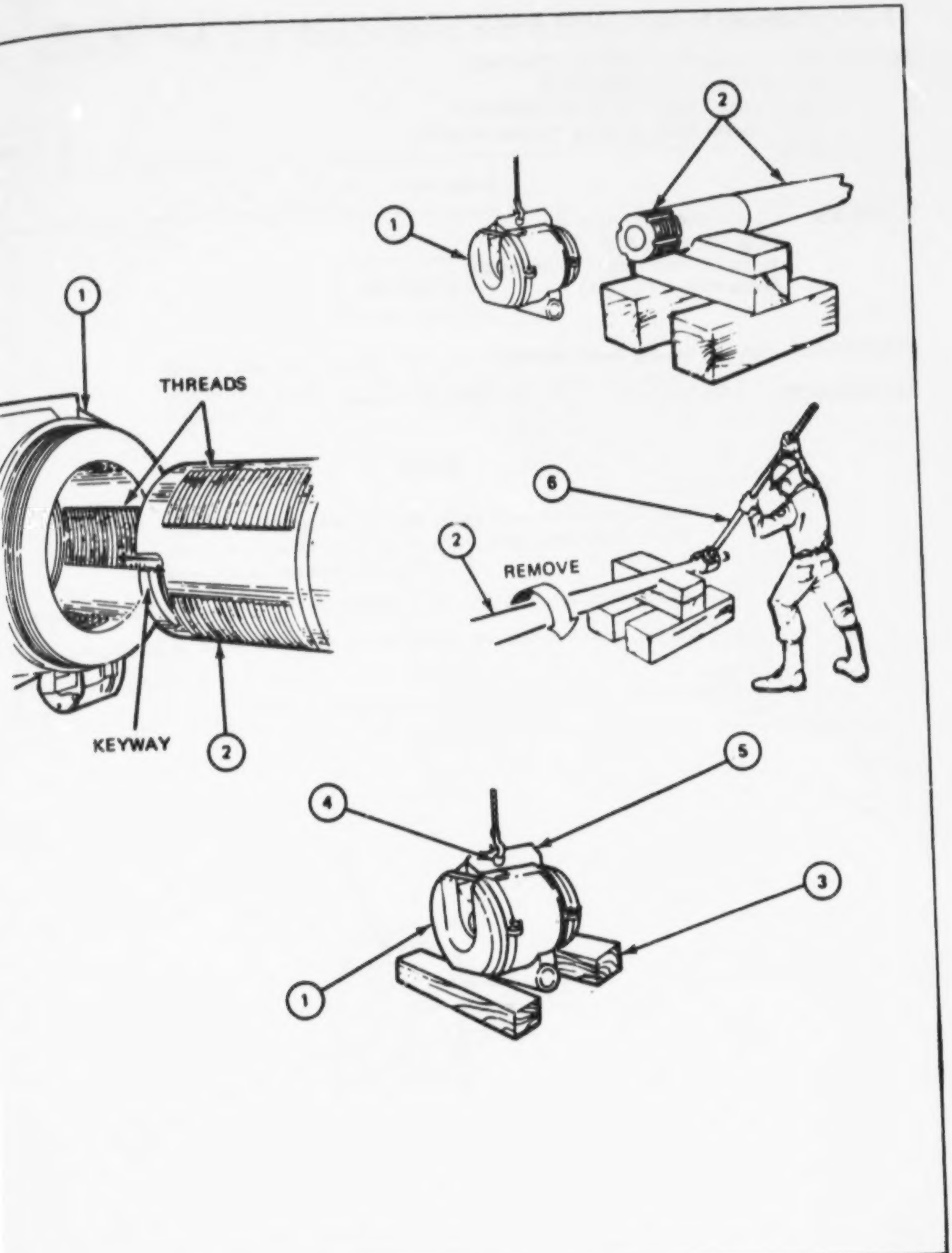
Step	Procedure
	WARNING Breech ring (3) weighs 740 pounds. Stay from under breech ring when it is lifted by hoist to prevent injury if it should fall. **NOTE** Soldier A: Operate hoist. Soldiers B and C: Guide breech ring. Soldier D: Turn cannon tube with girth wrench.
1.	Put girth wrench (1) on cannon tube (2).
2.	Using girth wrench (1) turn cannon tube (2), as shown, as far as it will turn (45 degrees) to clear keyway (3) and thread (4) of cannon tube and breech ring (5). GO TO FRAME 4


THREADS
KEYWAY
REMOVE

11-20. CANNON TUBE AND BREECH RING REMOVAL PROCEDURE (CONT)

FRAME 4

Step	Procedure
	CAUTION Machined surfaces of cannon tube (2) must not be scratched or damaged during removal. Threads in breech ring (1) and cannon tube (2) must not be damaged during removal. Stud in breech ring and keyway in cannon tube are used to guide breech ring off cannon tube. **NOTE** If breech ring (1) will not slide off cannon tube (2), turn cannon tube back and forth with girth wrench slightly for better alignment and clearance. Soldier A: Operate hoist. Soldiers B and C: Push and guide breech ring (1) during step 1.
1.	Using movable hoist, slide breech ring (1) off cannon tube (2).
	NOTE In order to work on breech ring (1), put breech ring on two wooden blocks. The lifting tool need not be removed. Breech ring may be laid flat on rear end, if necessary.
2.	Put breech ring (1) on two wooden blocks (3) on level ground or work bench and lower breech ring.
3.	Remove hoist hook (4) from breech lifting tool (5).
4.	Remove breech lifting tool (5).
5.	Remove girth wrench (6) from cannon tube (2).
	END OF TASK


THREADS
KEYWAY
REMOVE

11-21. CANNON TUBE AND BREECH RING INSTALLATION PROCEDURE

TOOLS: Breech lifting tool (4933-00-775-3742)
Movable hoist (4 ton capacity)
Girth wrench (NSN 4933-00-775-3745)
9/16" socket head screw key (Allen wrench)
Sling

SUPPLIES: Grease (item 12, App. A)
Rags (item 21, App. A)
Rope (10 feet long) (1" diameter)
Screw (MS 90728-64)

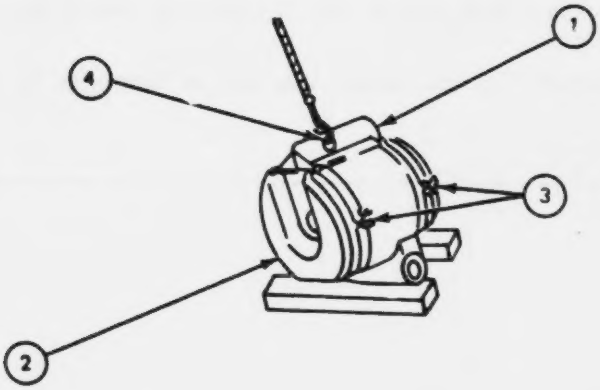
PERSONNEL: Four (including hoist operator)

REFERENCES: LO9-2350-215-12 for lubricating procedure

1-21. CANNON TUBE AND BREECH RING INSTALLATION PROCEDURE (CONT)

FRAME 1

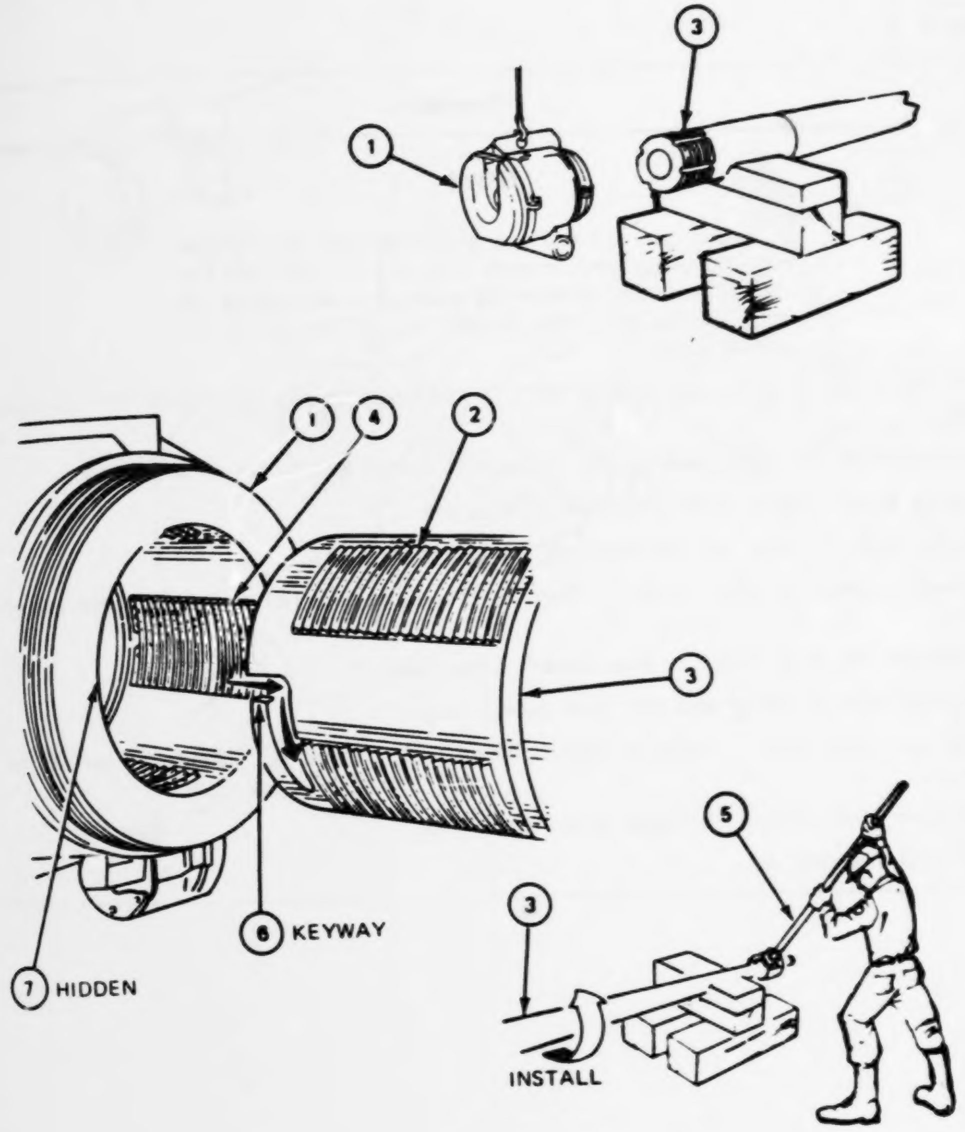
Step	Procedure
	WARNING Breech ring (2) weighs 740 pounds. Stay from under breech ring when it is lifted by hoist to prevent injury if it should fall. **NOTE** If hole in lifting tool (1) for lifting hook is too small, use clevis with large opening to allow hook clearance. Go to step 2 if lifting tool is installed.
1.	Attach breech lifting tool (1) to breech ring (2) and tighten wing nuts (3).
2.	Put hoist or sling hook (4) in hole or clevis on breech lifting tool (1).
	GO TO FRAME 2



11-21. CANNON TUBE AND BREECH RING INSTALLATION PROCEDURE (CONT

FRAME 2

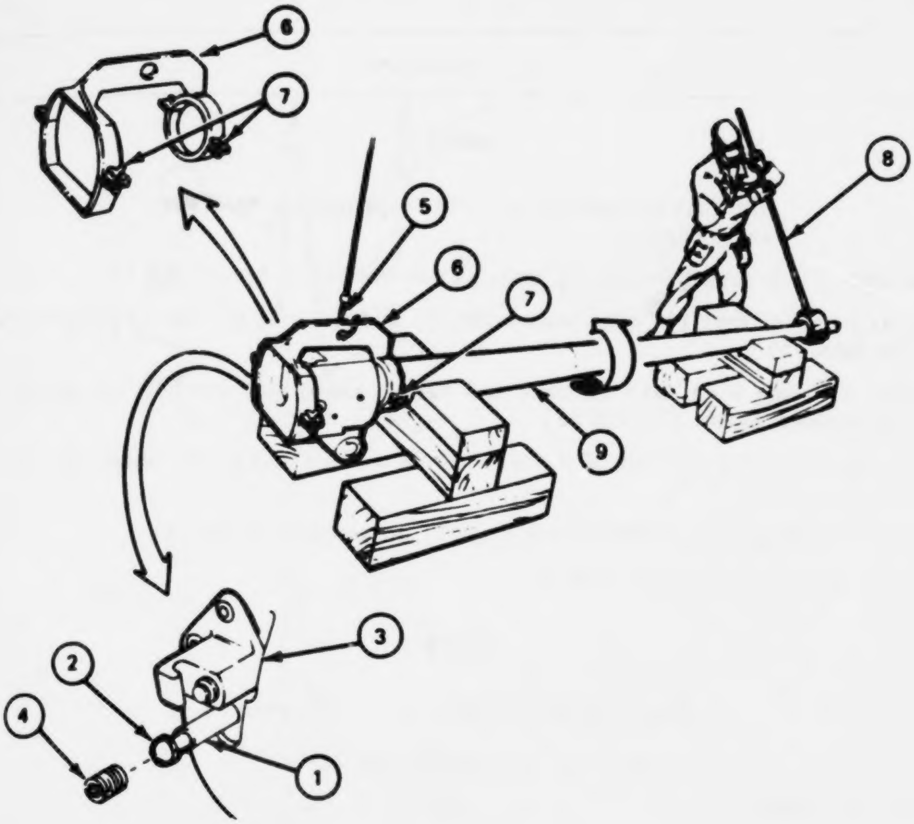
Step	Procedure
	CAUTION Machined surfaces of cannon tube (3) must not be scratched or damaged during installation. Threads (4) in breech ring (1) and threads (2) on cannon tube (3) must not be damaged during installation. Stud (7) in breech ring (1) and keyway (6) in cannon tube are used to guide breech ring on cannon tube.
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide breech ring (1).
1.	Using movable hoist, move breech ring (1) in line with threads (2) on cannon tube (3).
2.	Using rag, put thin coat of grease on cannon tube (3), threads (2), and threads (4) in breech ring (1) (LO).
3.	Soldier D: Put girth wrench (5) on cannon tube (3).
4.	Soldier D: Using girth wrench (5), turn cannon tube (3) to line up keyway (6) in cannon tube (3) with stud (7) in breech ring (1).
5.	Using movable hoist, push and guide breech ring (1) and slide breech ring on cannon tube (3) as far as it will go.
6.	Soldier D: Using girth wrench (5), turn cannon tube (3), as shown, as far as it will go (45 degrees).
	GO TO FRAME 3


7 HIDDEN
6 KEYWAY
INSTALL

11-21. CANNON TUBE AND BREECH RING INSTALLATION PROCEDURE (CONT)

FRAME 3

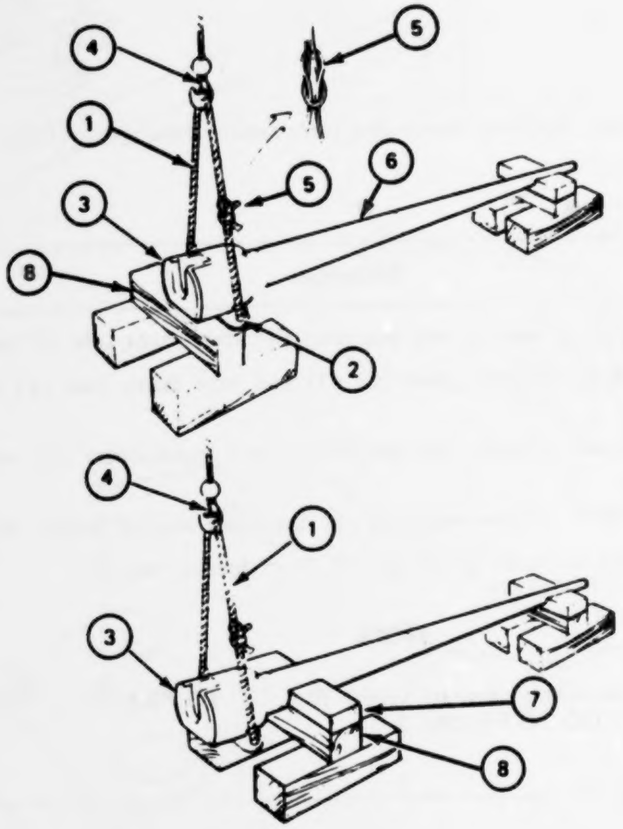
Step	Procedure
	NOTE If locking pin (1) will not go all the way into breech ring (3) using girth wrench (8), turn cannon tube (9) slightly back and forth while pushing in on locking pin until locking pin goes all the way in and locks the cannon tube.
1.	Put thin coat of grease on locking pin (1) and using fingers, put screw (2) into locking pin.
2.	Using screw (2), push locking pin (1) in breech ring (3) as far as it will go.
3.	Using hand, remove screw (2) from locking pin (1).
4.	Using Allen wrench, put set screw (4) in breech ring (3).
5.	Remove hoist and sling hook (5) from breech lifting tool (6) and move hoist out of the way.
6.	Remove two wing nuts (7) from breech lifting tool (6).
7.	Remove breech lifting tool (6) from breech ring (3).
8.	Put two wing nuts (7) back on breech lifting tool (6) and put lifting tool out of the way.
9.	Remove girth wrench (8) from cannon tube (9).
	GO TO FRAME 4



11-21. CANNON TUBE AND BREECH RING INSTALLATION PROCEDURE (CONT

FRAME 4

Step	Procedure
	NOTE Use rags for padding to protect rope making bend over sharp edges.
1.	Put rope (1) through two bearing holes (2) in bottom of breech ring (3).
2.	Run one end of rope (1) over hoist hook (4) and tie ends of rope (1) together with a square knot (5).
3.	Soldier A: Using hoist, take up slack and tighten knob, then carefully lift cannon tube (6) off wooden blocks (7) and (8).
4.	Move wooden block (7) out of the way. Move wooden blocks (8) under flat area of breech ring (3).
5.	Soldier A: Using hoist, lower breech ring (3) on wooden blocks (8).
6.	Remove sling hook (4) and rope (1).
	NOTE Follow-on Maintenance Action Required: Install recoil mechanism (para 11-16).
	END OF TASK



11-22. BREECH RING DISASSEMBLY PROCEDURE

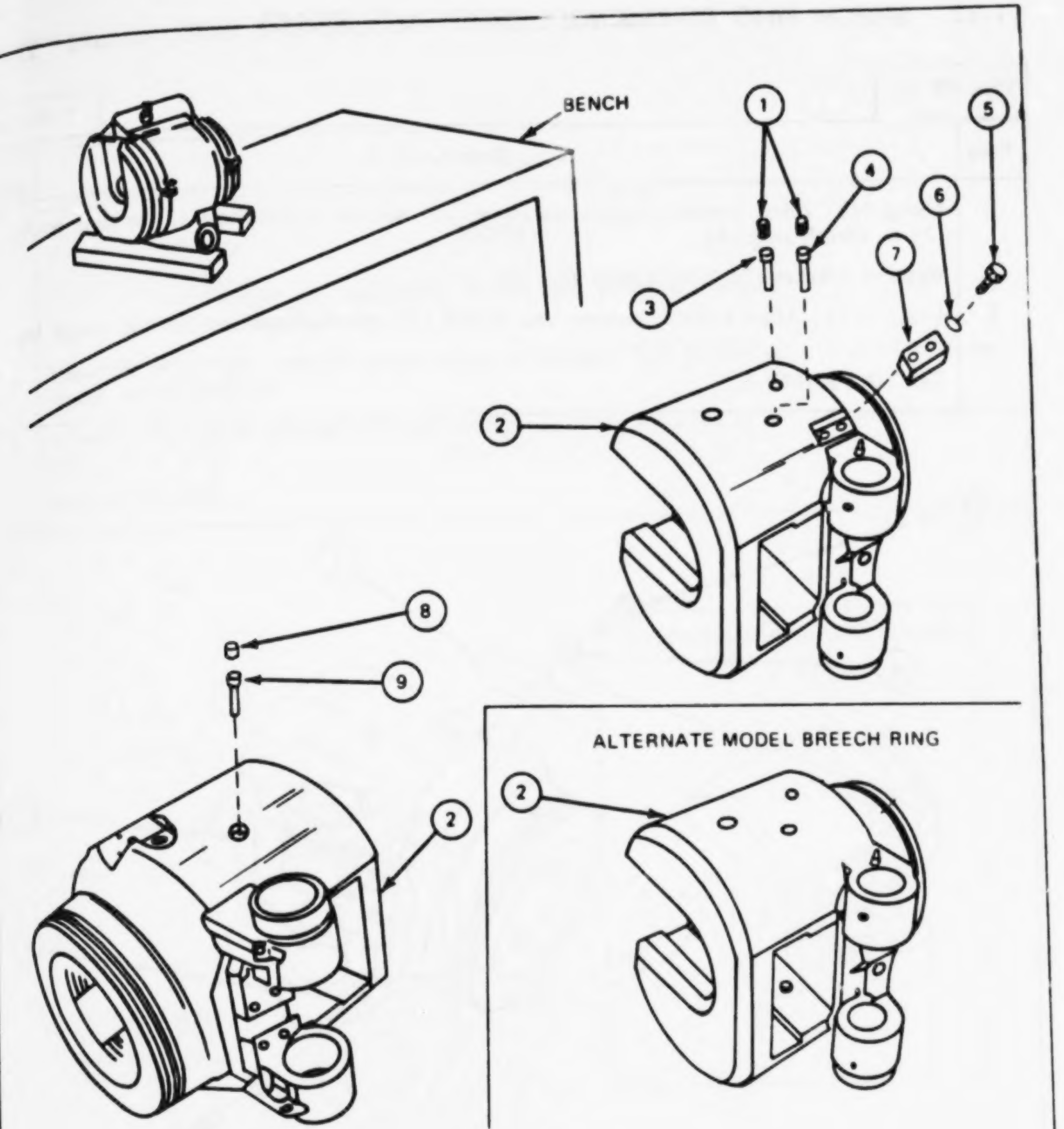
TOOLS: 5/16" socket head screw key (Allen wrench)
3/8" socket head screw key (Allen wrench)
9/16" socket head screw key (Allen wrench)
Small round file (1/16" diameter)
Bearing scraper

PERSONNEL: Two

PRELIMINARY PROCEDURES: Remove breech ring from cannon tube (para 11-20)

FRAME 1

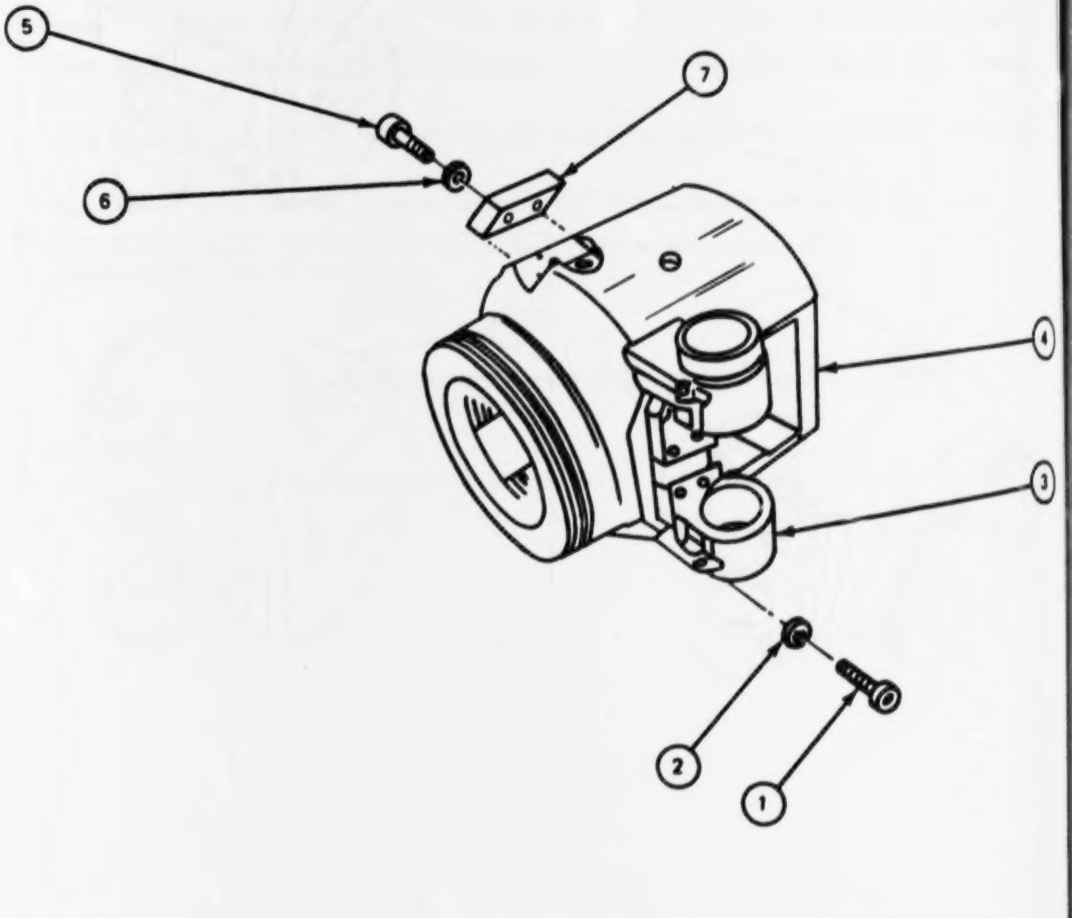
Step	Procedure
1.	Using 9/16" Allen wrench, remove two setscrews (1) from right side of breech ring (2).
2.	Using hand, remove right extractor pivot pin (3) and tube index stud (4) from breech ring (2).
3.	Using 5/16" Allen wrench, remove two screws (5), two lockwashers (6) and torque key (7).
4.	Using 9/16" Allen wrench, remove setscrew (8) from left side of breech ring (2).
5.	Using hand, remove left extractor pivot pin (9) from breech ring (2).
	NOTE If disassembling alternate breech ring, GO TO FRAME 3. If not, GO TO FRAME 2.
	GO TO FRAME 2


BENCH
ALTERNATE MODEL BREECH RING

11-22. BREECH RING DISASSEMBLY PROCEDURE (CONT)

FRAME 2

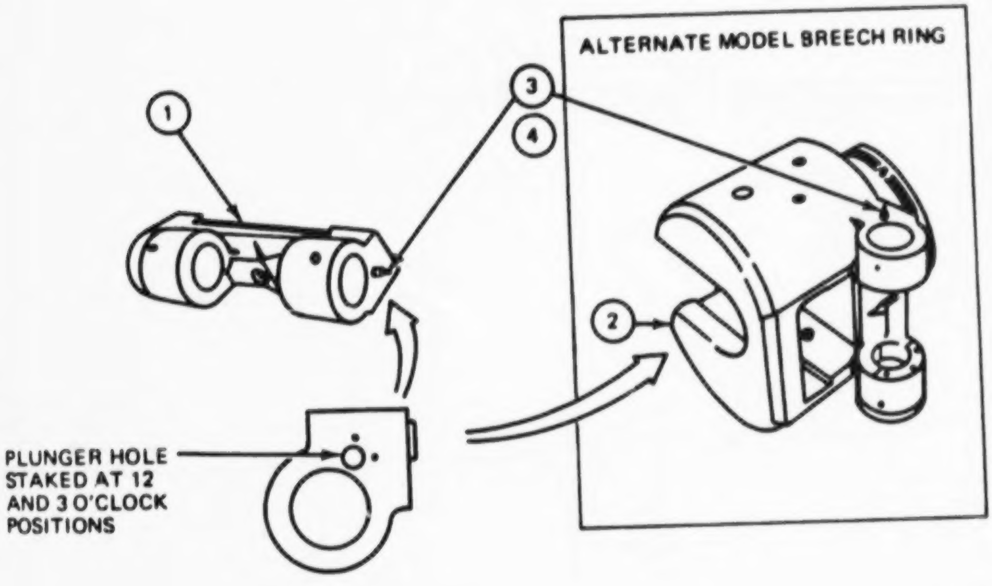
Step	Procedure
1.	Using 3/8" Allen wrench, remove six screws (1) and six lockwashers (2) holding bracket (3) to breech ring (4).
2.	Remove bracket (3) from breech ring (4).
3.	Using 5/16" Allen wrench, remove two screws (5), two lockwashers (6) and torque key (7).
	GO TO FRAME 3



-22. BREECH RING DISASSEMBLY PROCEDURE (CONT)

RAME 3

Step	Procedure
	NOTE Plunger (3) may have to be held down to provide working clearance.
1.	Using file or scraper, remove staked edges of plunger hole in bracket (1) or in alternate model breech ring (2).
2.	Using hand, remove plunger (3) and spring (4) from bracket (1) or from breech ring (2).
	END OF TASK


ALTERNATE MODEL BREECH RING
1
3
4
2
PLUNGER HOLE STAKED AT 12 AND 3 O'CLOCK POSITIONS

11-23. BREECH RING ASSEMBLY PROCEDURE

TOOLS: Center punch
8 ounce ball peen hammer
5/16" socket head screw key (Allen wrench)
3/8" socket head screw key (Allen wrench)
9/16" socket head screw key (Allen wrench)
1/2" drive torque wrench (0 to 150 foot-pounds)
3/8" hex head socket (1/2" drive)

PERSONNEL: Two

REFERENCES: JPG for procedures to:
Use torque wrench
Stake screws

11-23. BREECH RING ASSEMBLY PROCEDURE (CONT)

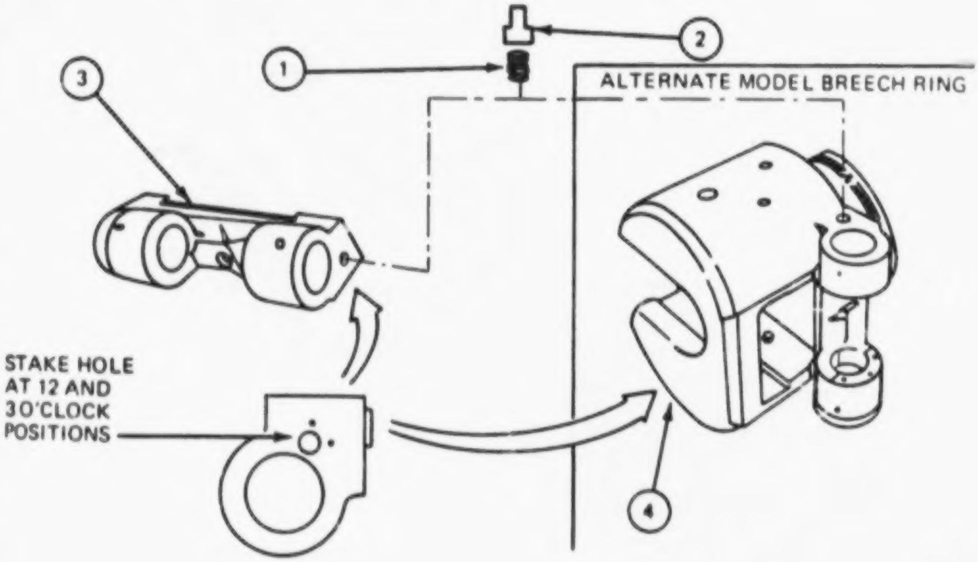
FRAME 1

Step	Procedure
1.	Using hand, put spring (1) and plunger (2) into hole in bracket (3) or in alternate model breech ring (4) and hold plunger (2) down.
2.	Using hammer and punch, stake plunger hole in bracket (3) at 12 and 3 o'clock positions (JPG).

NOTE

If assembling alternate model breech ring, GO TO FRAME 3. If not, GO TO FRAME 2.

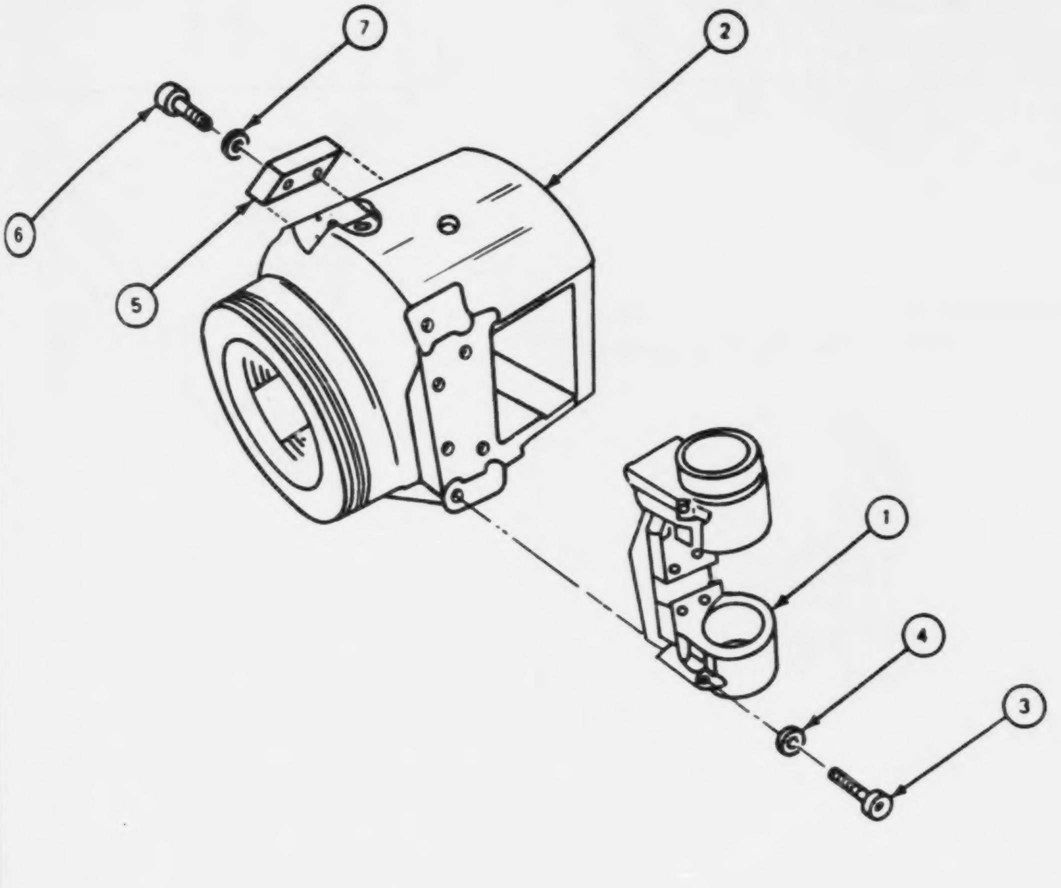
GO TO FRAME 2


3
1
2
ALTERNATE MODEL BREECH RING
STAKE HOLE AT 12 AND 3 O'CLOCK POSITIONS
4

11-23. BREECH RING ASSEMBLY PROCEDURE (CONT)

FRAME 2

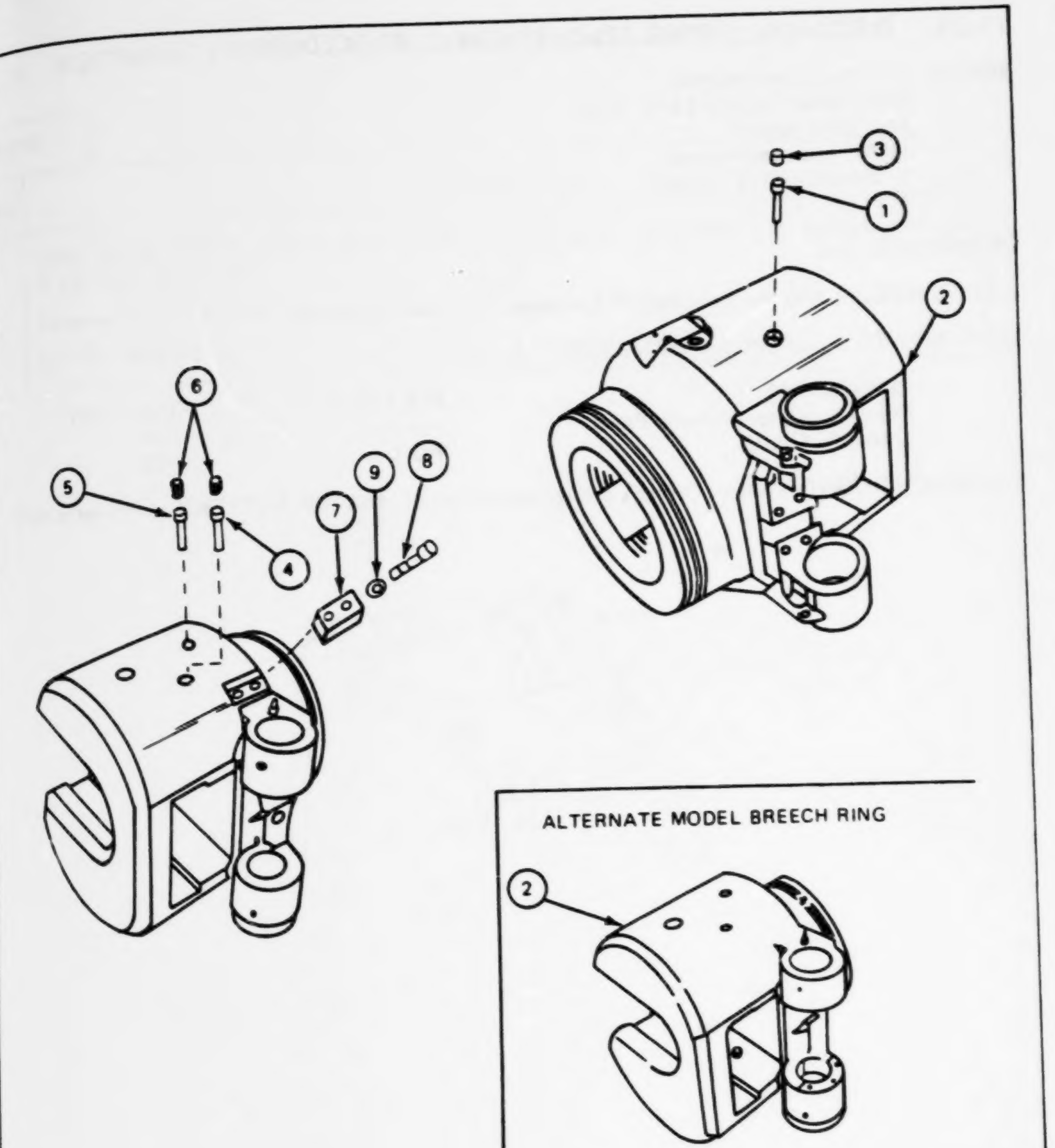
Step	Procedure
1.	Using 3/8" Allen wrench, attach bracket (1) to breech ring (2) with six screws (3) and six lockwashers (4).
2.	Using torque wrench, tighten six screws (3) to between 75 and 85 foot-pounds (JPG).
3.	Using 5/16" Allen wrench, attach torque key (5) to breech ring (2) with two screws (6) and two lockwashers (7).
	GO TO FRAME 3



11-23. BREECH RING ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using hand, put left extractor pivot pin (1) into hole in left side of breech ring (2).
2.	Using 9/16" Allen wrench, put setscrew (3) into same hole as extractor pivot pin (1).
3.	Using hand, put right extractor pivot pin (4) and tube index stud (5) into holes in right side breech ring (2).
4.	Using 9/16" Allen wrench, put two setscrews (6) into same holes as extractor pivot pin (4) and tube index stud (5).
5.	Using hammer and punch, stake (2) setscrews (6) and setscrew (3) (JPG).
6.	Using 5/16" Allen wrench, attach torque key (7) to breech ring (2) with two screws (8) and two lockwashers (9).
	END OF TASK


ALTERNATE MODEL BREECH RING

11-24. ELECTRICAL FIRING LEAD REMOVAL PROCEDURE

TOOLS: 1/4" flat tip screwdriver
7/16" socket wrench (3/8" drive)
3/8" drive ratchet
1-1/8" open end wrench
5" extension (3/8" drive)

PERSONNEL: One

REFERENCES: JPG for procedure to disconnect electrical connectors

EQUIPMENT LOCATION INFORMATION:

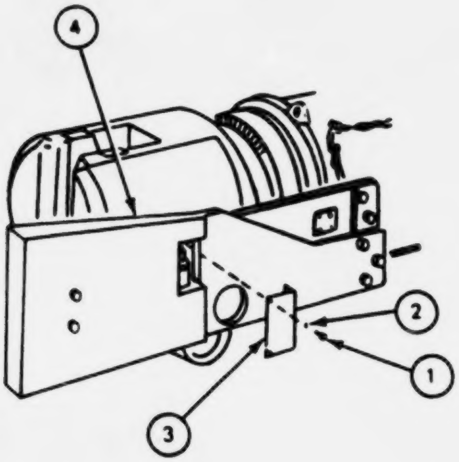
EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Gunner's Guard	FO-1	20

EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF

-24. ELECTRICAL FIRING LEAD REMOVAL PROCEDURE (CONT)

RAME 1

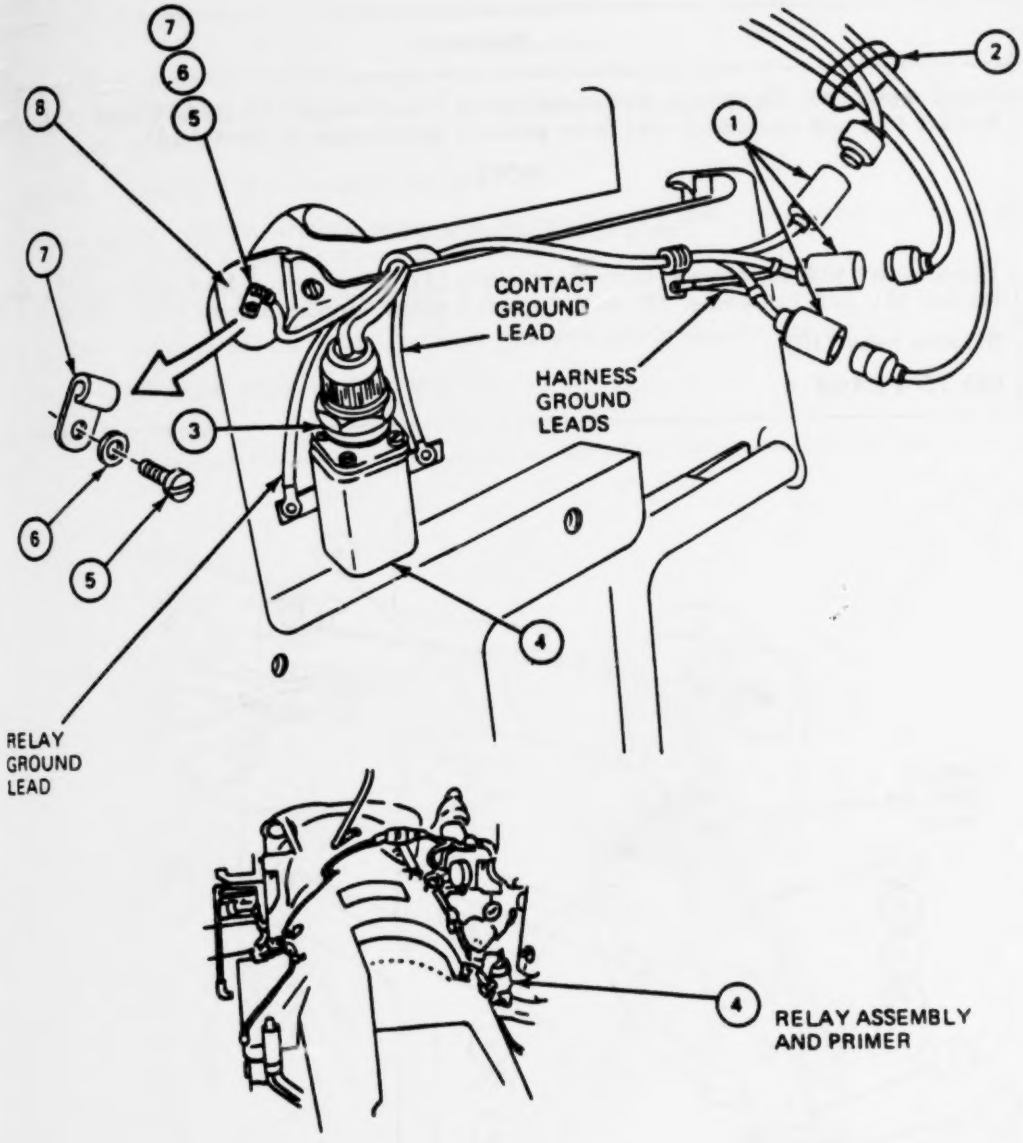
tep	Procedure
1.	Using socket wrench, remove four screws (1) and four lockwashers (2) holding cover (3) to gunner's guard (4).
2.	Remove cover (3) from gunner's guard (4).
	GO TO FRAME 2



11-24. ELECTRICAL FIRING LEAD REMOVAL PROCEDURE (CONT)

FRAME 2

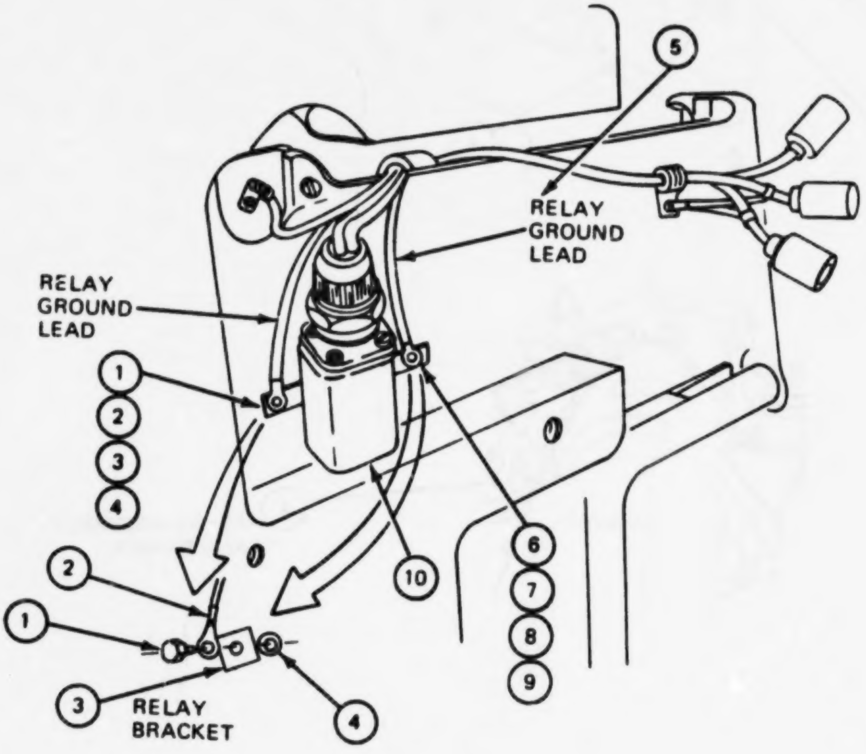
Step	Procedure
1.	Disconnect three electrical connectors (1) (circuits 113C, 113D, 113E) from harness assembly (2) (JPG).
2.	Using open end wrench, remove connector (3) from relay (4) (JPG).
3.	Using screwdriver, remove lockwasher screw (5) and lockwasher (6) holding terminal (circuit 113E) (7) to primer contact (8).
	GO TO FRAME 3


7
6
8
5
2
1
7
CONTACT
GROUND
LEAD
HARNESS
GROUND
LEADS
3
6
5
4
RELAY
GROUND
LEAD
4
RELAY ASSEMBLY
AND PRIMER

11-24. ELECTRICAL FIRING LEAD REMOVAL PROCEDURE (CONT)

FRAME 3

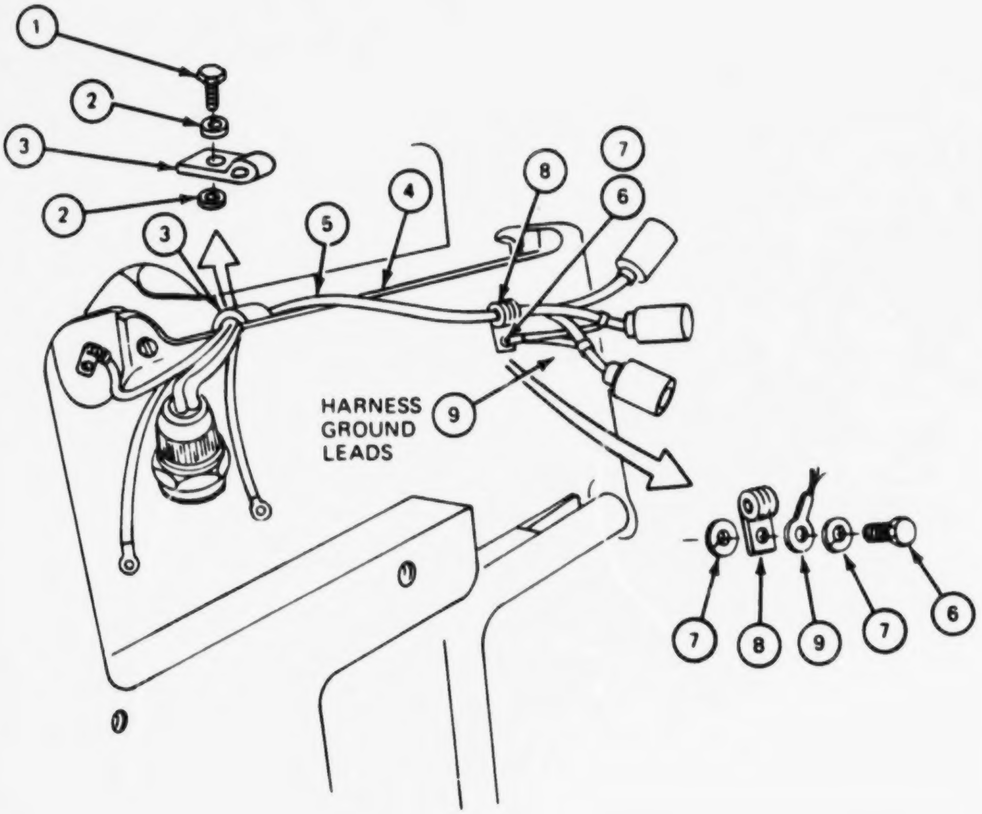
Step	Procedure
1.	Using socket wrench, remove lockwasher screw (1), relay ground lead terminal (2), relay bracket (3), and lockwasher (4) from gunner's guard support bracket (5). **NOTE** Hold relay so it will not fall.
2.	Using socket wrench, remove lockwasher screw (6), relay ground lead terminal (7), relay bracket (8), and lockwasher (9) from gunner's guard support bracket (5).
3.	Remove relay (10). GO TO FRAME 4


5
RELAY GROUND LEAD
RELAY GROUND LEAD
1
2
3
4
6
7
8
9
10
2
1
3
RELAY BRACKET
4

11-24. ELECTRICAL FIRING LEAD REMOVAL PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using socket wrench, remove screw (1), lockwasher (2), cable clamp (3), and lockwasher (2) from gunner's guard bracket (4).
2.	Remove harness (5) from cable clamp (3).
3.	Using socket wrench, remove screw (6), lockwasher (7) cable clamp (8), and lockwasher (7) from gunner's guard support bracket (4).
4.	Remove harness (5) from cable clamp (8).
5.	Separate harness ground leads (9) from gunner's guard support bracket (4).
6.	Remove electrical firing lead harness (5).
	END OF TASK



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1-25. ELECTRICAL FIRING LEAD INSTALLATION PROCEDURE

OOLS: 1/4'' flat tip screwdriver
7/16'' socket (3/8'' drive)
3/8'' drive ratchet
1-1/8'' open end wrench
5'' extension (3/8'' drive)
3/8'' drive torque wrench (0 to 50 foot-pounds)

ERSONNEL: One

EFERENCES: JPG for procedures to:
Connect electrical connectors
Use torque wrench

QUIPMENT LOCATION INFORMATION:

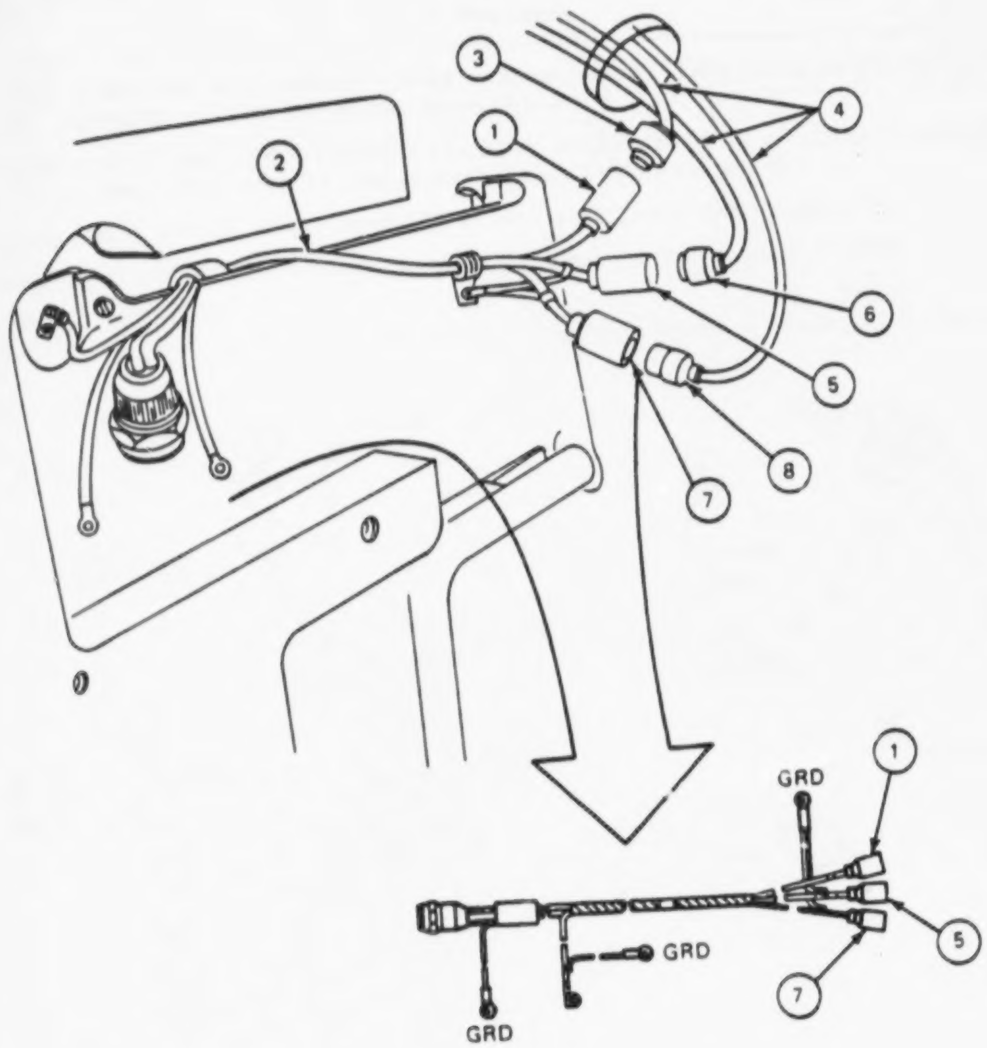
EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10

QUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF

11-25. ELECTRICAL FIRING LEAD INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	CAUTION Cable connectors must be connected to receptacles which match circuit numbers on metal tabs attached to wires near connectors. Wrong connections will damage equipment.
1.	Connect connector (circuit 113C) (1) of electrical firing lead harness (2) to connector (circuit 113C) (3) of harness (11676327) (4) (JPG).
2.	Connect connector (circuit 113D) (5) of harness (2) to connector (circuit 113D) (6) of harness (4) (JPG).
3.	Connect connector (circuit 113E) (7) of harness (2) to connector (circuit 113E) (8) of harness (4) (JPG).
	GO TO FRAME 2

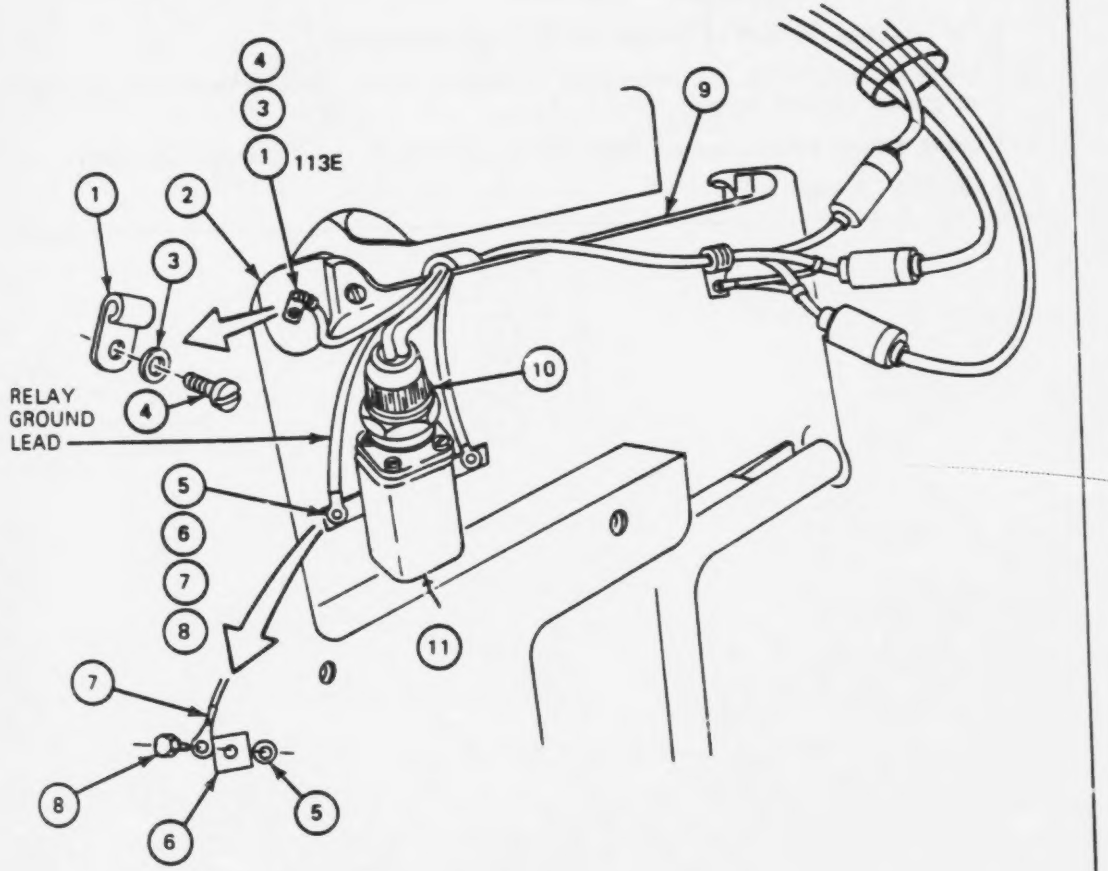


GRD
GRD
GRD

11-25. ELECTRICAL FIRING LEAD INSTALLATION PROCEDURE (CONT)

FRAME 2

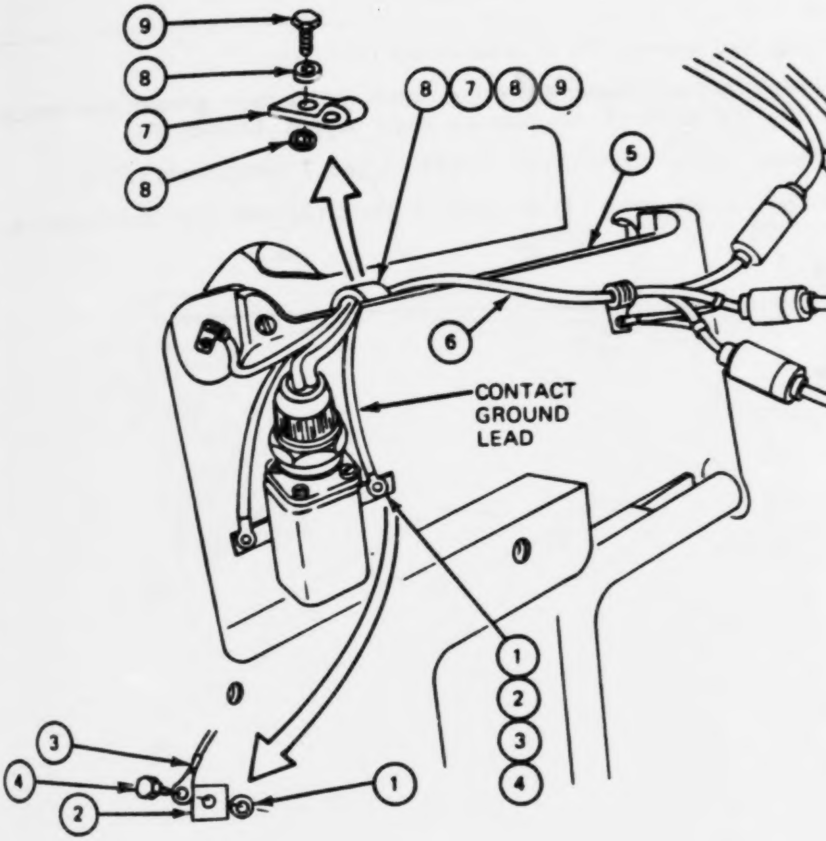
Step	Procedure
1.	Using screwdriver, attach primer contact terminal (circuit 113E) (1) to primer contact (2) with lockwasher (3) and lockwasher screw (4).
2.	Using socket wrench, put lockwasher (5), relay bracket (6), relay ground lead terminal (7), and lockwasher screw (8) on gunner's guard support bracket (9).
3.	Using torque wrench, torque screw (8) to between 5 and 7 foot-pounds (JPG).
4.	Using open end wrench, connect electrical connector (10) to relay (11) (JPG).
	GO TO FRAME 3



11-25. ELECTRICAL FIRING LEAD INSTALLATION PROCEDURE (CONT)

FRAME 3

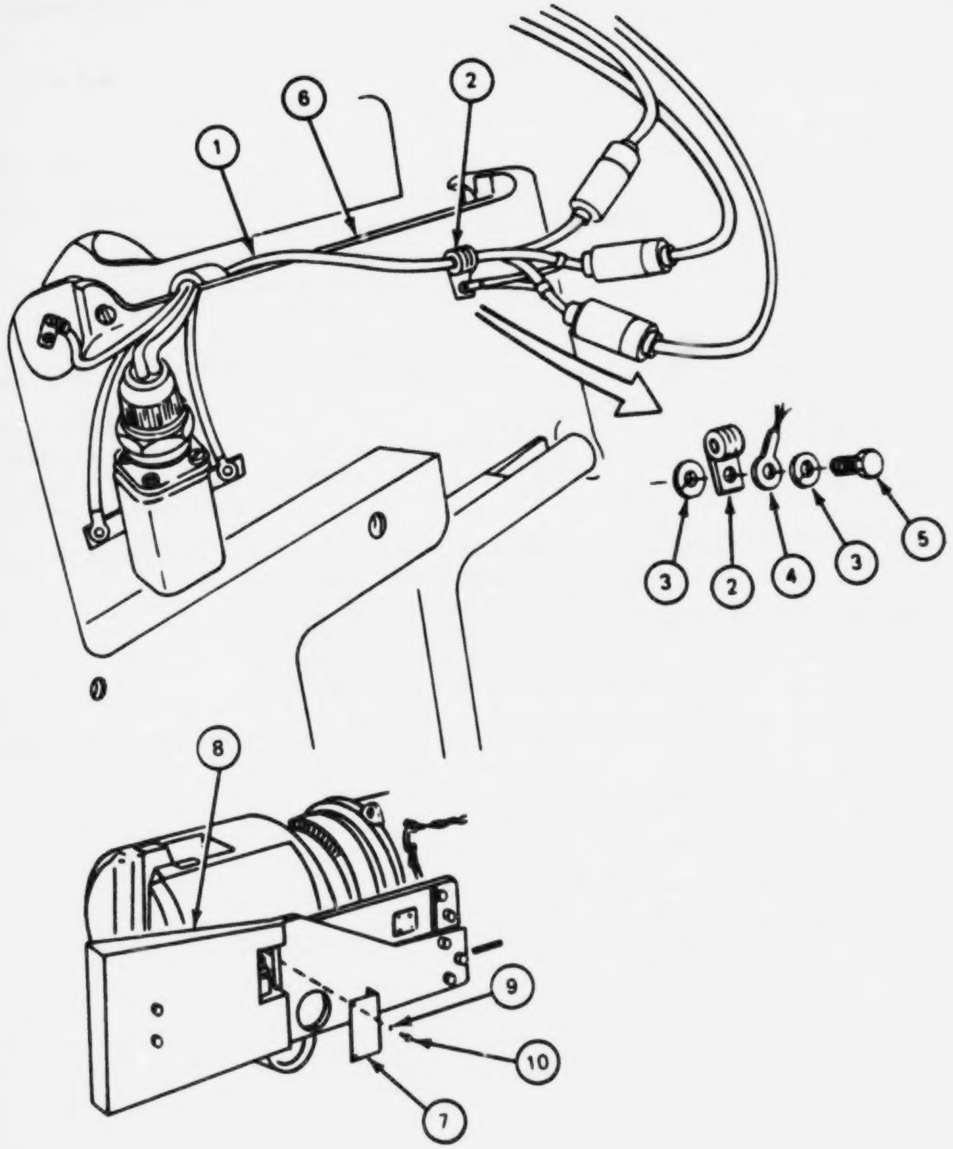
Step	Procedure
1.	Using socket wrench, put lockwasher (1), relay bracket (2), contact ground lead terminal (3) and lockwasher screw (4) on gunner's guard support bracket (5).
2.	Using torque wrench, torque lockwasher screw (4) to between 5 and 7 foot-pounds (JPG).
	CAUTION Make sure cables are not pinched under clamps. Make sure cables are not kinked at cable bends. Pinching or kinking will damage cable.
3.	Put electrical firing lead harness (6) in cable clamp (7).
4.	Using socket wrench, put lockwasher (8), cable clamp (7), lockwasher (8) and screw (9 on gunner's guard support bracket (5).
5.	Using torque wrench, torque screw (9) to between 5 and 7 foot-pounds (JPG).
	GO TO FRAME 4


8 7 8 9
CONTACT
GROUND
LEAD

11-25. ELECTRICAL FIRING LEAD INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Put electrical firing lead harness (1) in cable clamp (2).
2.	Using socket wrench, put lockwasher (3) cable clamp (2), harness ground lead terminal (4), lockwasher (3) and screw (5) on gunner's guard support bracket (6).
3.	Using torque wrench, torque screw (5) to between 5 and 7 foot-pounds (JPG).
4.	Using socket wrench, attach cover (7) to gunner's guard (8) with four lockwashers (9) and four screws (10). END OF TASK



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11-26. GUNNER'S GUARD REMOVAL PROCEDURE

TOOLS: Chain hoist
Movable hoist (4 ton capacity)
3/4" combination wrench
3/4" socket (1/2" drive)
1/2" drive ratchet
2" extension (1/2" drive)

SUPPLIES: Eye bolt

PERSONNEL: Three

REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
Remove M13A3 fire control elevation quadrant
Remove safety relay switch
Remove blasting machine
Remove rate sensor

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Gunner's Guard	FO-1	20
Driver's Master Control Panel	FO-4	10
Turret Traverse Lock	FO-4	6

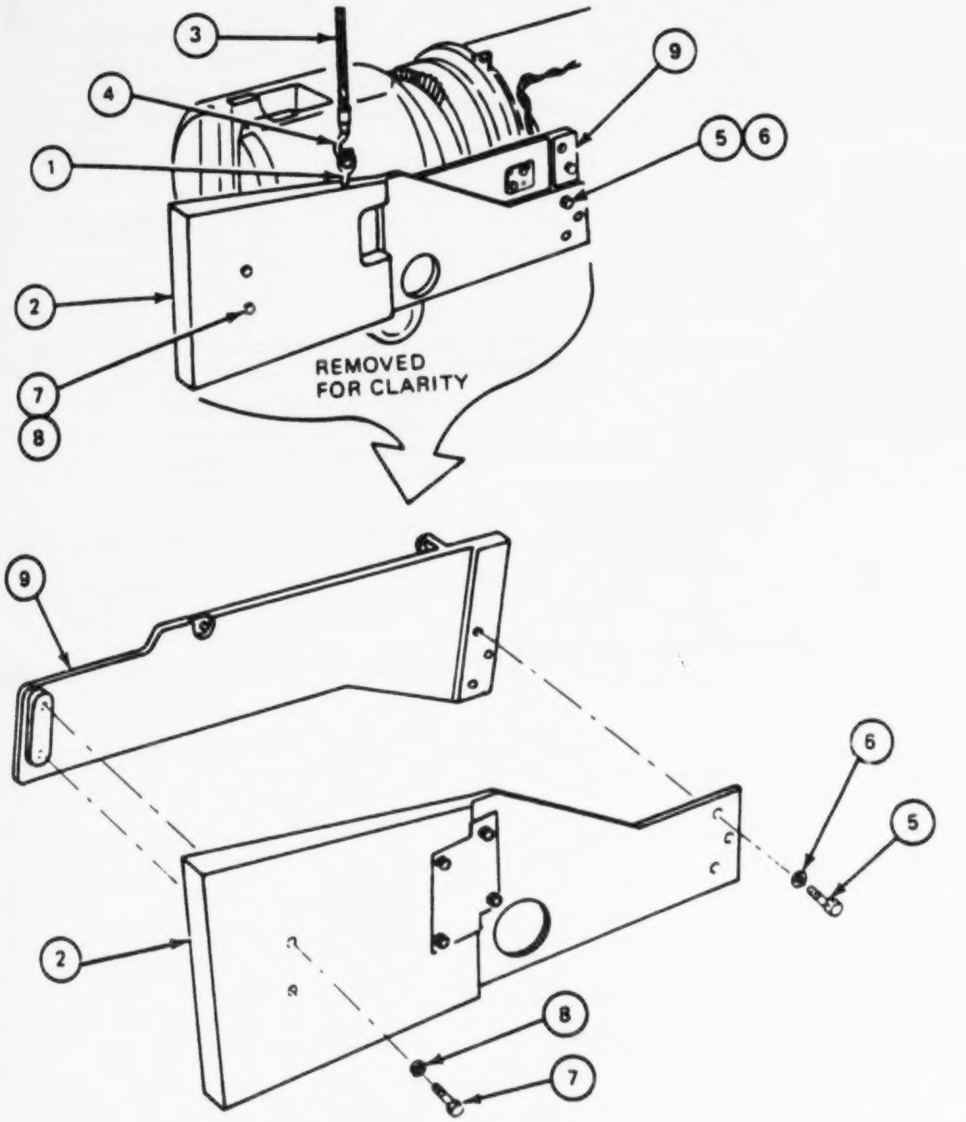
EQUIPMENT CONDITION: M13A3 fire control elevation quadrant removed (TM-20-2-3)
Safety relay switch removed (TM-20-2-3)
Blasting machine removed (TM-20-2-3)
Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED
Rate sensor and bracket removed (TM-20-2-3)

PRELIMINARY PROCEDURS: Remove electrical firing lead (para 11-24)

11-26. GUNNER'S GUARD REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING
	Gunner's guard (2) weighs about 170 pounds. Keep feet from under guard while moving it. Guard will crush your feet if it falls.
1.	Put eye bolt (1) in gunner's guard (2).
2.	Put chain hoist (3) over gunner's guard (2).
3.	Put chain hoist hook (4) in eye bolt (1).
	NOTE
	Do not over lift when taking up slack or screws will bind. Soldier A: Operate chain hoist (3).
4.	Using chain hoist (3), remove all slack.
	NOTE
	Check chain hoist (3) for no slack. Soldier B: Support gunner's guard (2).
5.	Soldier C: Using socket wrench, remove screw (5) and lockwasher (6).
6.	Soldier C: Using socket wrench, remove two screws (7) and two lockwashers (8) hol gunner's guard (2) to gunner's guard support bracket (9).
7.	Soldiers B and C: Separate gunner's guard (2) from gunner's guard support bracket
	NOTE
	Soldiers B and C: Guide gunner's guard (2) during Step Step 8.
8.	Soldier A: Using chain hoist (3), remove gunner's guard (2) and lower to turret flo
9.	Remove chain hoist hook (4) and eye bolt (1) from gunner's guard (2).
	NOTE
	Do steps 10 and 11 if gunner's guard (2) was removed for maintenance.
10.	Soldier A: Using movable hoist, remove gunner's guard (2) through commander's h and lower to floor.
11.	Move movable hoist to clear area.
	END OF TASK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11-27. GUNNER'S GUARD INSTALLATION PROCEDURE

TOOLS: 2" extension (1/2" drive)
Movable hoist (4 ton capacity)
Sling
3/4" combination wrench
3/4" socket (1/2" drive)
1/2" drive ratchet
1/2" drive torque wrench (0 to 250 foot-pounds)
Chain hoist

SUPPLIES: Eye bolt

PERSONNEL: Three

REFERENCES: JPG for procedure to use torque wrench
TM 9-2350-257-20-2-3 for procedures to:
- Install safety relay switch
- Install blasting machine
- Install M13A3 fire control elevation quadrant
- Install rate sensor and bracket

EQUIPMENT LOCATION INFORMATION:

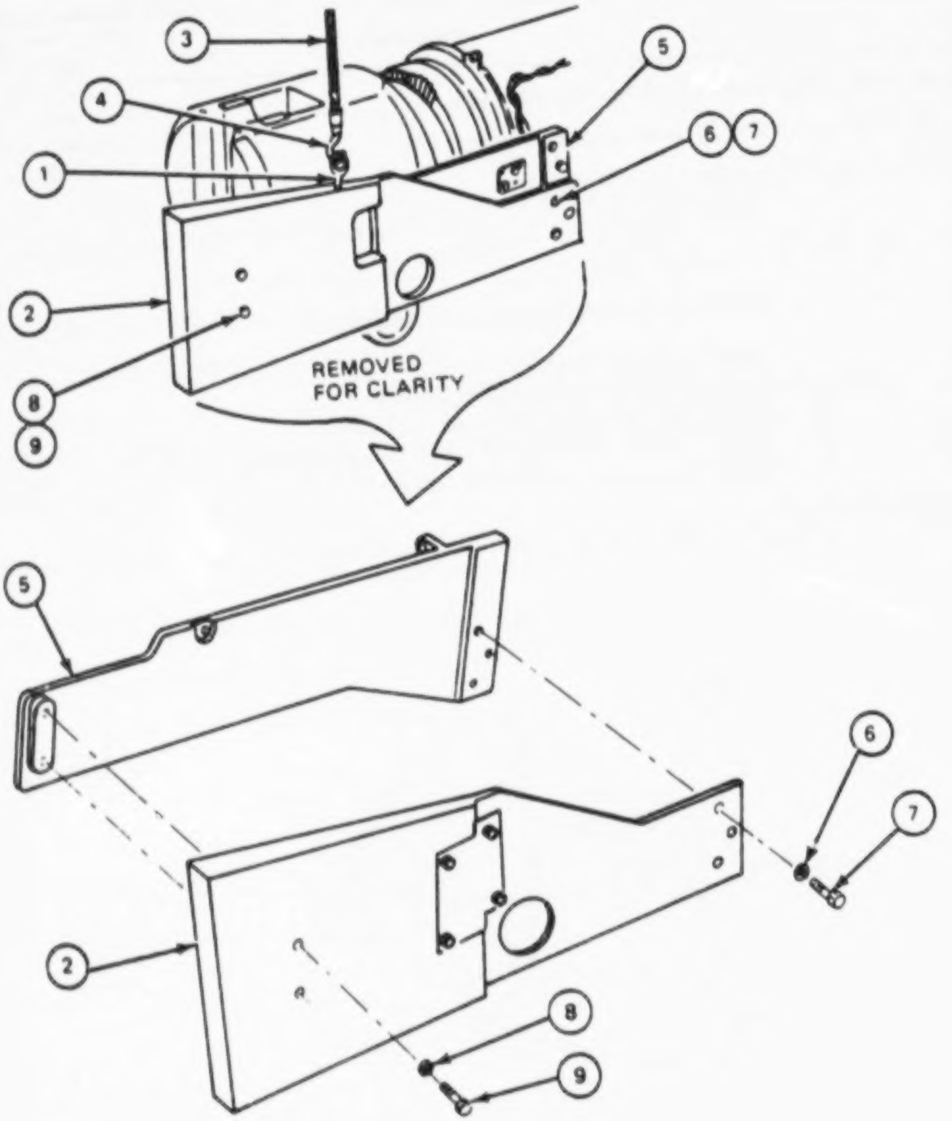
EQUIPMENT	FOLDOUT	CALLOUT
Gunner's Guard	FO-1	20

PRELIMINARY PROCEDURES: Install gunner's guard support bracket (para 11-29)

11-27. GUNNER'S GUARD INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Gunner's guard (2) weighs about 170 pounds. Keep feet from under guard while moving it. Guard will crush your feet if it falls.
1.	Put eye bolt (1) in gunner's guard (2).
2.	Put sling (3) with hoist over gunner's guard (2).
3.	Put sling hook (4) in eye bolt (1).
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide gunner's guard (2) and move to gunner's guard support bracket (5).
4.	Using hoist, lift and move gunner's guard (2).
5.	Using hoist, move gunner's guard (2) and guide to gunner's guard support bracke
6.	Soldier B: Align gunner's guard (2) with gunner's guard support bracket (5) and place.
	NOTE Soldier C will do steps 7 through 9.
7.	Using socket wrench, put in lockwasher (6) and screw (7).
8.	Using socket wrench, put in two lockwashers (8) and two screws (9).
9.	Using torque wrench, torque screw (7) and two screws (9) to between 70 and 90 f pounds (JPG).
	GO TO FRAME 2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11-27. GUNNER'S GUARD INSTALLATION PROCEDURE (CONT)

FRAME 2

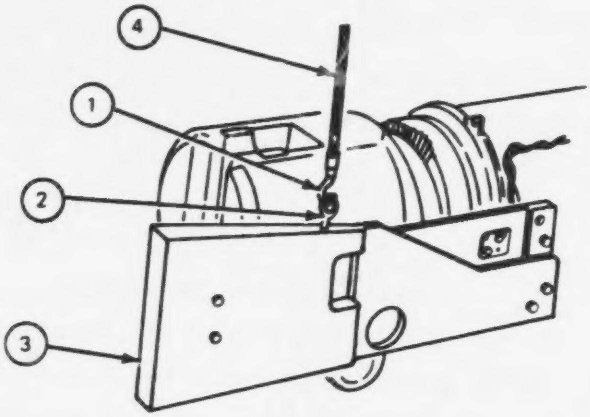
Step	Procedure
1.	Remove sling hook (1) from eye bolt (2).
2.	Remove eye bolt (2) from gunner's guard (3).
3.	Move hoist and sling (4) to clear area.

NOTE

Follow-on Maintenance Action Required:

Install safety relay switch (TM-20-2-3).
Install blasting machine (TM-20-2-3).
Install electrical firing lead (para 11-25).
Install M13A3 fire control elevation quadrant (TM-20-2-3).
Install rate sensor and bracket (TM-20-2-3).

END OF TASK



11-28. GUNNER'S GUARD SUPPORT BRACKET REMOVAL PROCEDURE

TOOLS: Chain hoist
Diagonal cutting pliers
Long nose pliers
3/4" socket (1/2" drive)
2" extension (1/2" drive)
1/2" drive ratchet
15/16" socket (1/2" drive)
Universal (1/2" drive)

SUPPLIES: Rope (10 feet long) (3/4" diameter)

PERSONNEL: Three (including hoist operator)

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Gunner's Guard	FO-1	20
Driver's Master Control Panel	FO-4	10
Turret Traverse Lock	FO-4	6

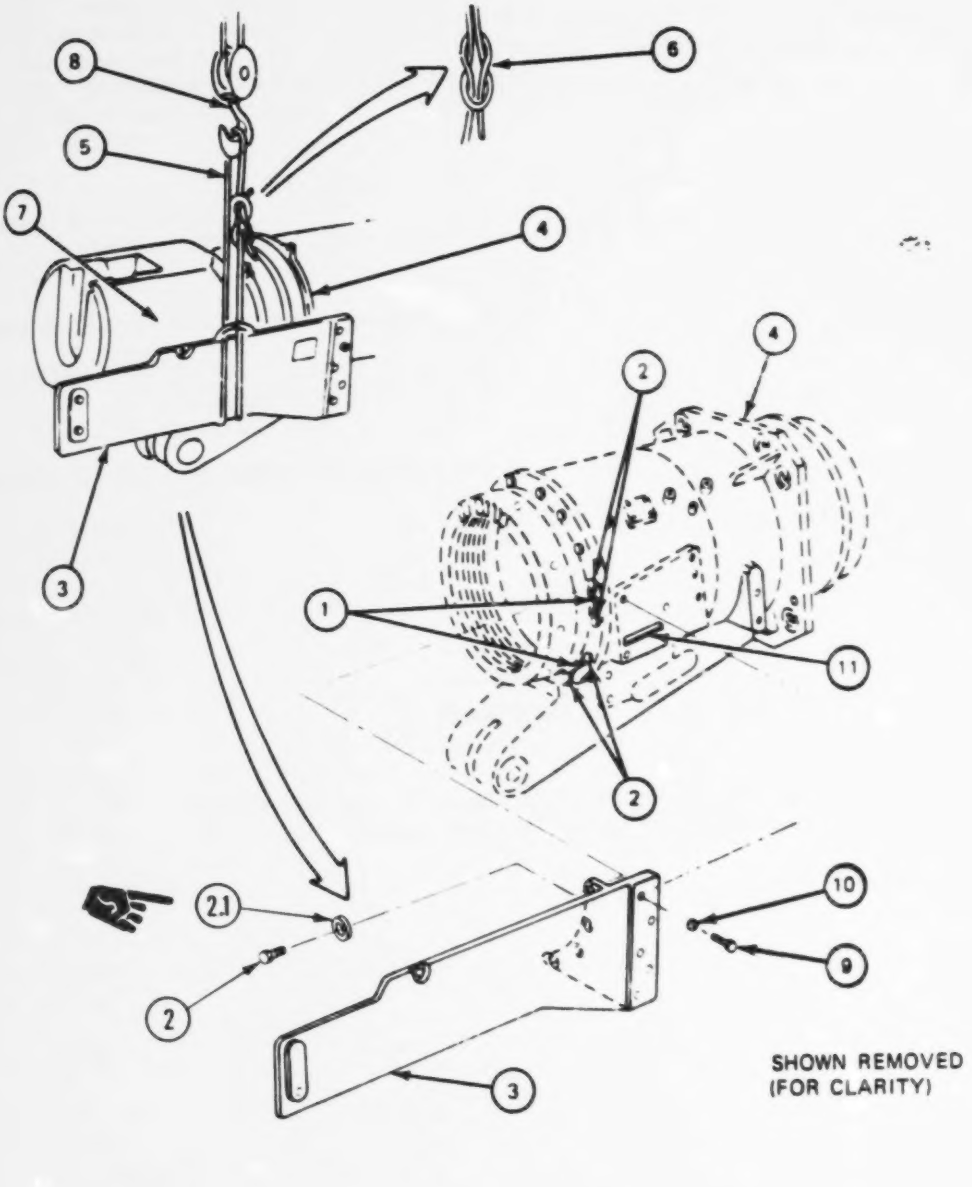
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Turret traverse lock set to LOCKED.

PRELIMINARY PROCEDURES: Remove gunner's guard (para 11-26)

11-28. GUNNER'S GUARD SUPPORT BRACKET REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Support bracket weighs about 80 pounds. Do not drop while removing. It will crush your toes.
1.	Using diagonal cutting pliers, cut two lockwires (1) holding four screws (2).
2.	Using long nose pliers, remove two lockwires (1) from four screws (2).
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
3.	Using socket wrench, remove four screws (2) and four flat washers (2.1) holding support bracket to recoil mechanism (4). Throw all screws and washers away.
4.	Using rope, make loop (5) and tie ends together with a square knob (6).
5.	Push one end of loop (5) between gun (7) and support bracket (3) far enough to allow other end to be pushed through it.
6.	Soldier A: Using hoist, put hook (8) through rope loop (5) and raise hook (8) to take up slack and tighten square knob (6). Do not overlift.
	NOTE Soldier B: Hold support bracket (3). If gun is in place, watch guide key on breech ring of gun (7).
7.	Soldier C: Using 3/4" socket wrench, remove two screws (9) and two lockwashers (10) holding support bracket (3) on guide key (11) of recoil mechanism (4).
	NOTE Soldier A: Operate hoist. Soldiers B and C: Guide and remove support bracket (3) during Step 8.
8.	Using hoist, remove support bracket (3) from recoil mechanism (4) and gun (7).
9.	Put support bracket (3) in clear area.
10.	Remove rope loop (5) and move hoist to clear area.
	END OF TASK


8
6
5
7
4
4
2
3
1
11
2
2.1
10
9
2
3
SHOWN REMOVED
(FOR CLARITY)

11-29. GUNNER'S GUARD SUPPORT BRACKET INSTALLATION PROCEDURE

TOOLS:
Universal (1/2" drive)
Diagonal cutting pliers
Long nose pliers
3/4" socket (1/2" drive)
2" extension (1/2" drive)
1/2" drive ratchet
1/2" drive torque wrench (0 to 250 foot-pounds)
15/16" socket (1/2" drive)
Chain hoist

SUPPLIES:
Screws (four)
Lockwire (MS 20995-C32)

PERSONNEL: Three (including hoist operator)

REFERENCES: JPG for procedures to:
Use torque wrench
Install lockwire

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Gunner's Guard	FO-1	20

GENERAL INSTRUCTIONS:

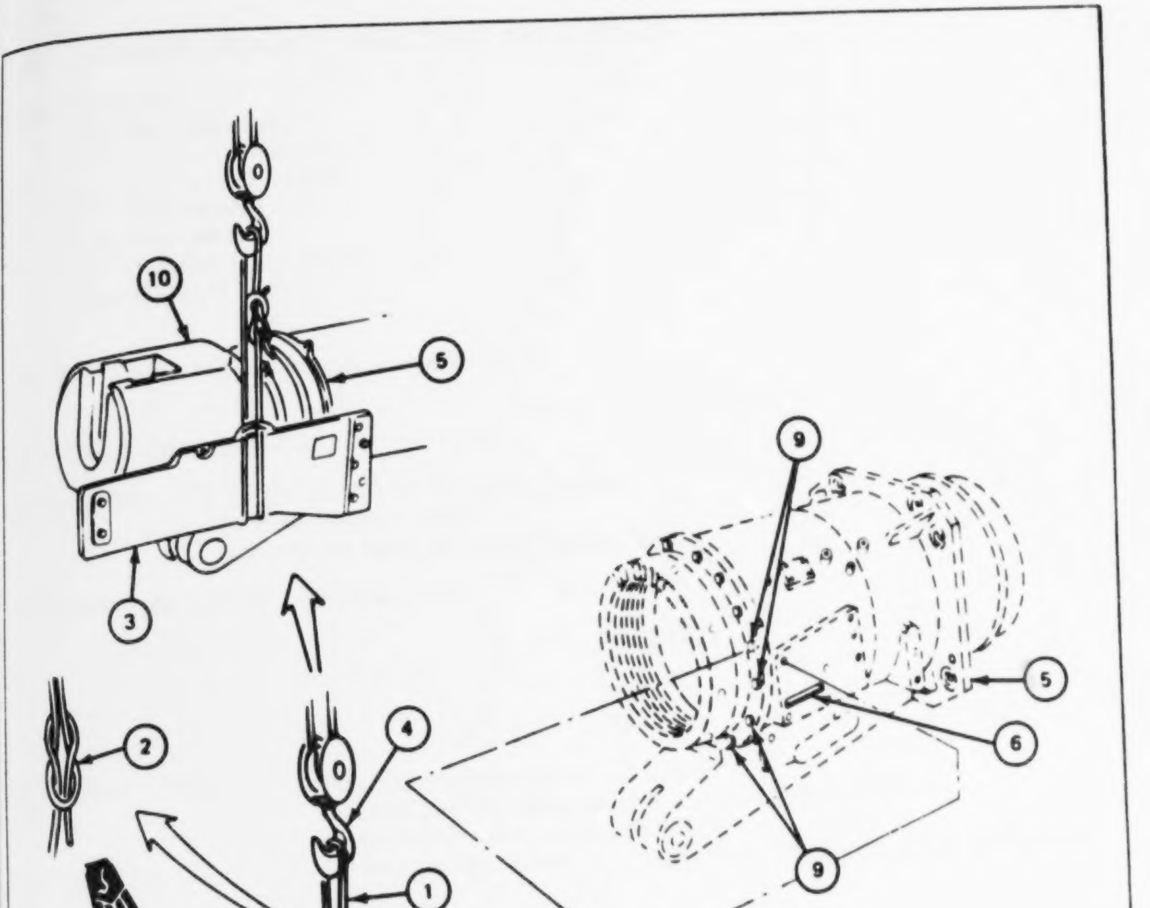
WARNING

Support bracket (3) weighs about 80 pounds. Do not drop while installing. Support bracket will crush your toes.

11-29. GUNNER'S GUARD SUPPORT BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using rope, make loop (1) and tie ends together with square knot (2).
2.	Put rope loop (1) around support bracket (3) as shown.
	NOTE Soldier A: Operate hoist.
3.	Using hoist, put hook (4) through loop (1) and raise hook (4) to take up slack and tighten knot (2).
4.	Using hoist, raise support bracket (3) and position near recoil mechanism (5).
	NOTE If gun is in place, key on breech ring of gun (10) will also have to be aligned.
5.	Soldiers B and C: Line up key slot in support bracket (3) with key (6) on recoil mechanism (5).
	NOTE Soldier B: Hold bracket (3) while Soldier C puts in screws.
6.	Using 3/4" socket wrench, attach support bracket (3) to recoil mechanism (5) with two lockwashers (7) and two screws (8).
7.	Remove rope and move hoist to clear area.
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
8.	Using socket wrench, put four new screws (9) and four new flat washers (9.1) in support bracket (3).
9.	Using 3/4" socket and torque wrench, torque two screws (8) to between 70 and 90 fo pounds (JPG).
10.	Using torque wrench, torque four screws (9) to between 90 and 110 foot-pounds for 1/2-in. screws and between 120 and 140 foot-pounds for 9/16-in. screws (JPG).
11.	Using needle nose pliers and diagonal cutting pliers, install lockwire on two screws (9) (JPG).
12.	Repeat step 11 for two more screws (9).
	NOTE Follow-on Maintenance Action Required: Install gunner's guard (para 11-27).
	END OF TASK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(FOR CLARITY)

11-30. TORQUE BRACKET REMOVAL PROCEDURE

TOOLS: Chain hoist
Diagonal cutting pliers
3/4" socket (1/2" drive)
2" extension (1/2" drive)
1/2" drive ratchet
Long nose pliers
15/16" socket (1/2" drive)
Universal (1/2" drive)

SUPPLIES: Rope (10 feet long) (3/4" diameter)

PERSONNEL: Three (including hoist operator)

REFERENCES: TM 9-2350-257-20-2-3 for procedures to:
Remove loader's guard
Remove machine gun mounting bracket

EQUIPMENT LOCATION INFORMATION:

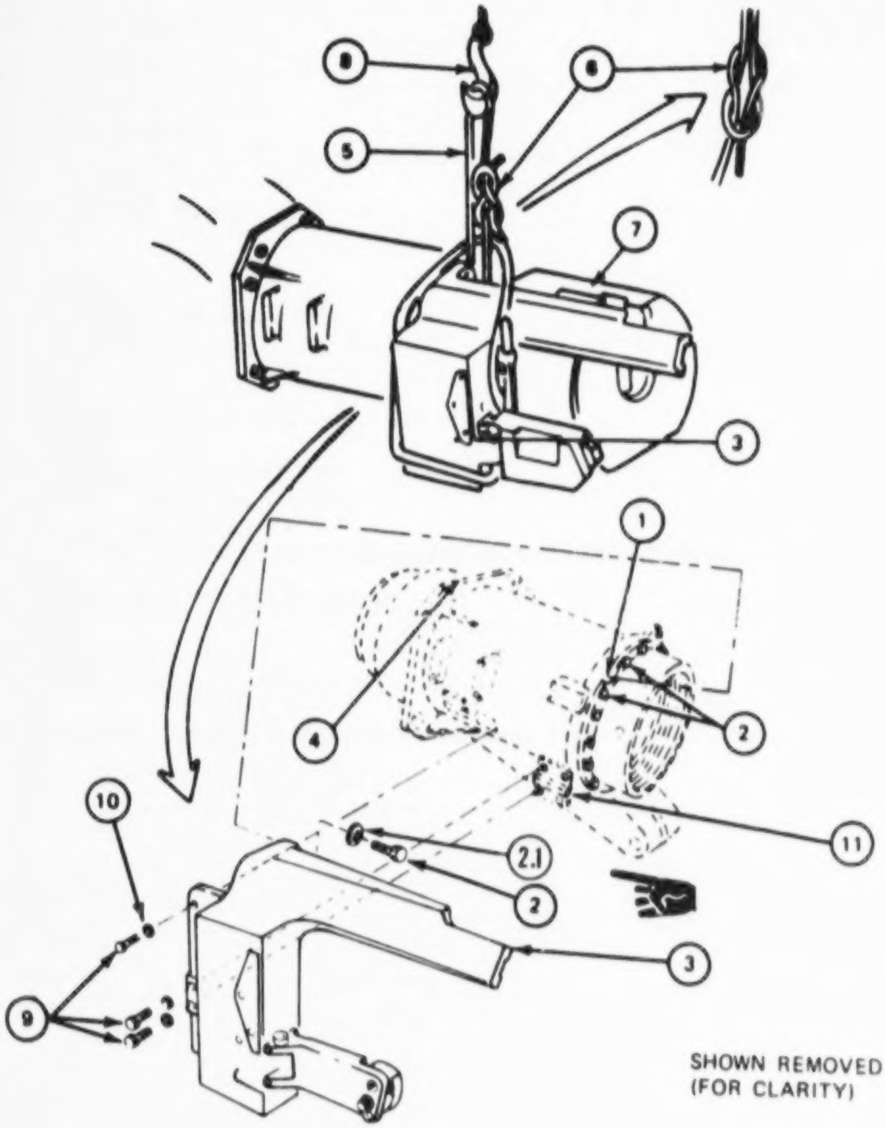
EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Loader's Guard	FO-3	22
Turret Traverse Lock	FO-4	6

EQUIPMENT CONDITION: Loader's guard removed (TM-20-2-3)
Machine gun mounting bracket removed (TM-20-2-3)
Turret traverse lock set to LOCKED
Driver's master control panel MASTER BATTERY switch set to OFF

11-30. TORQUE BRACKET REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Torque bracket (3) weighs about 80 pounds. Do not drop while removing. Torque bracket will crush your toes.
1.	Using diagonal cutting pliers, cut lockwire (1) holding two screws (2).
2.	Using long nose pliers, remove lockwire (1) from two screws (2).
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
3.	Using socket wrench, remove two screws (2) and two flat washers (2.1) holding torque bracket (3) to recoil mechanism (4). Throw all screws and washers away.
4.	Using rope, make loop (5) and tie ends together with square knot (6).
5.	Push one end of loop (5) between gun (7) and torque bracket (3) far enough to allo other end to be pushed through it as shown.
	NOTE Soldier A: Operate hoist.
6.	Using hoist, put hook (8) through loop (5) and raise hook to take up slack and tigh knot (6). Do not overlift.
	NOTE Soldier A: Use hoist to hold torque bracket (3) while Soldier B removes screws.
7.	Using 3/4" socket wrench, remove six screws (9) and six lockwashers (10) holding torque bracket (3) to recoil mechanism (4).
8.	Soldiers B and C: Pull torque bracket (3) off guide key (11).
9.	Soldier A: Using hoist, move torque bracket (3) to clear area.
10.	Remove rope loop (5) and hoist. END OF TASK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(FOR CLARITY)

11-31. TORQUE BRACKET INSTALLATION PROCEDURE

TOOLS:
- Chain hoist
- Diagonal cutting pliers
- Long nose pliers
- 3/4" socket (1/2" drive)
- 2" extension (1/2" drive)
- 1/2" drive ratchet
- 1/2" drive torque wrench (0 to 250 foot-pounds)
- 15/16" socket (1/2" drive)
- Universal (1/2" drive)

SUPPLIES:
- Screws (two)
- Lockwire (MS 20945-C32)
- Rope (10 feet long) (3/4" diameter)

PERSONNEL: Three (including hoist operator)

REFERENCES: JPG for procedures to:
  Use torque wrench
  Install lockwire
TM 9-2350-257-20-2-3 for procedure to install loader's guard

EQUIPMENT LOCATION INFORMATION:

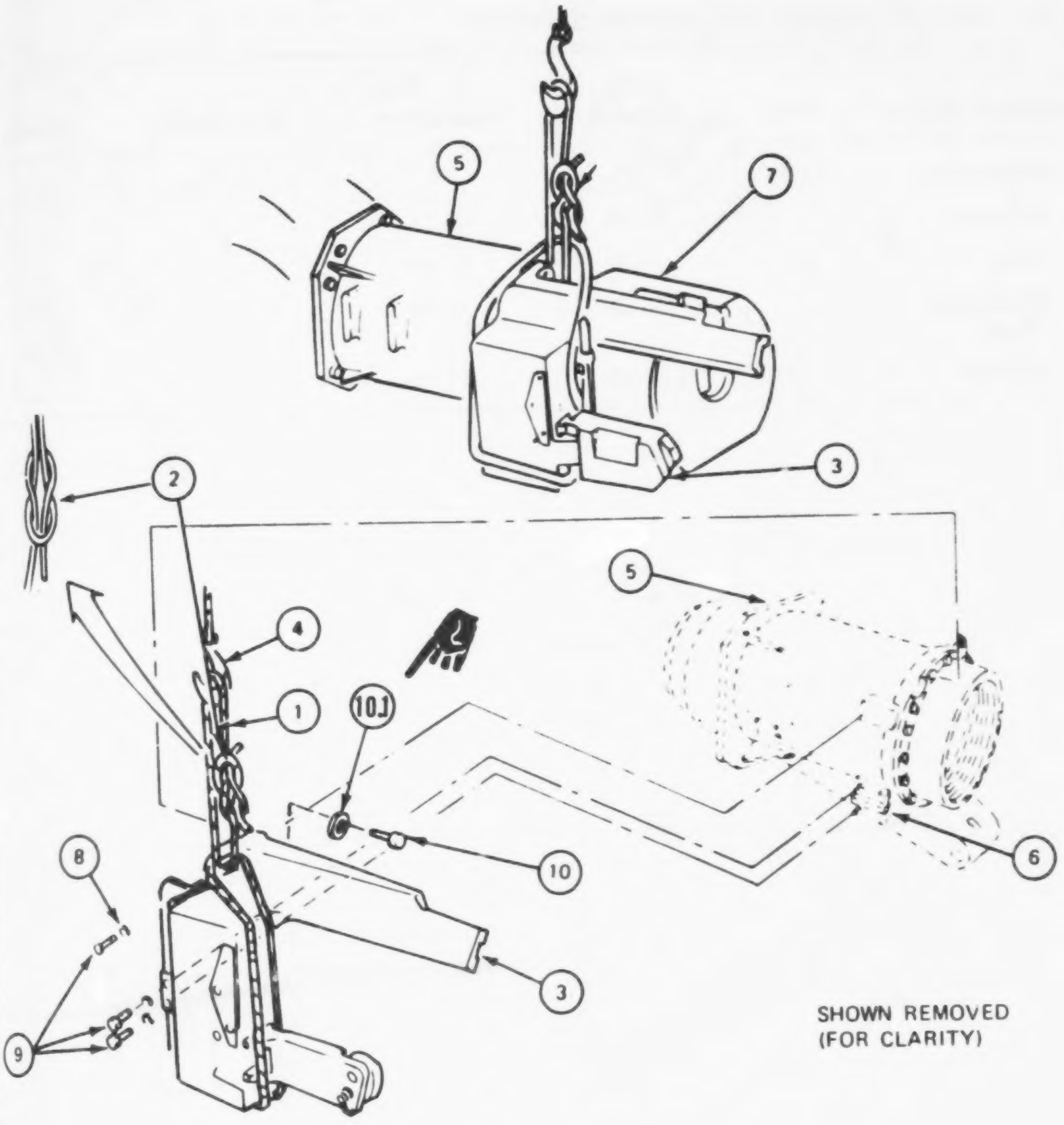
EQUIPMENT	FOLDOUT	CALLOUT
Loader's Guard	FO-3	22

PRELIMINARY PROCEDURES: Install recoil mechanism (para 11-16)

11-31. TORQUE BRACKET INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING Torque bracket (3) weighs about 80 pounds. Do not drop while installing. Torque bracket will crush your toes.
1.	Using rope, make loop (1) and tie ends together with square knot (2).
2.	Put rope loop (1) around torque bracket (3) as shown.
	NOTE Soldier A: Operate hoist.
3.	Using hoist, put hook (4) through rope loop (1) and raise hook to take up slack and tighten knot (2).
4.	Using hoist, raise torque bracket (3) and position near recoil mechanism (5).
5.	Soldiers B and C: Line up key slot in torque bracket (3) with key (6) on recoil mechanism (5) and key on gun (7). Push torque bracket on keys.
	NOTE Soldier B: Hold bracket while Soldier C puts in screws.
6.	Using 3/4" socket wrench, attach torque bracket (3) to recoil mechanism (5) with six lockwashers (8) and six screws (9).
	NOTE Early gun mounts require 3/4" socket. Late or modified gun mounts require 15/16" socket.
7.	Using socket wrench, attach torque bracket (3) to recoil mechanism (5) with two new screws (10) and two new flat washers (10.1).
8.	Using 3/4" socket and torque wrench, torque six screws (9) to between 70 and 90 foot-pounds (JPG).
9.	Using torque wrench, torque two screws (10) to between 90 and 110 foot-pounds for 1/2-in. screws and between 120 and 140 foot-pounds for 9/16-in. screws (JPG).
10.	Using needle nose pliers and diagonal cutting pliers, lockwire two screws (10) (JPG).
	NOTE Follow-on Maintenance Action Required: Install loader's guard (TM-20-2-3).
	END OF TASK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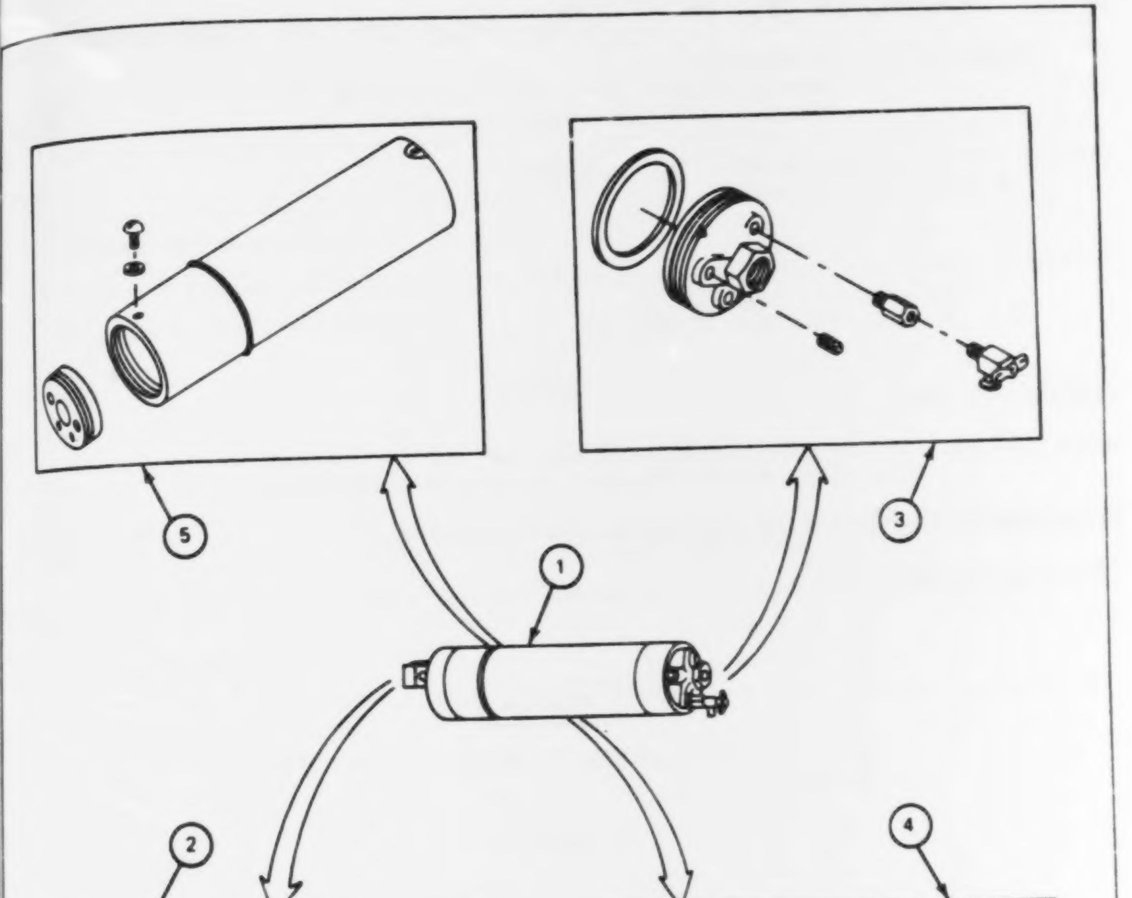
(FOR CLARITY)

Section 4. REPLENISHER

11-32. MAINTENANCE PROCEDURES INDEX

Equipment Item	Test	Tasks Removal	Installation	Disassembly	Assembly
1. Replenisher	11-33			11-34	11-35
2. Indicator		11-36	11-37		
3. Head		11-38	11-39		
4. Piston and Tape		11-38	11-39		
5. Cylinder		11-38	11-39		



11-33. REPLENISHER TEST PROCEDURE

TEST EQUIPMENT: M3 oil pump
Suitable hydraulic fittings, preformed packings, and tools
Watch (or clock) with sweep second hand

TOOLS: 1/2" combination wrench
9/16" combination wrench

SUPPLIES: Pan
Rags (item 21, App. A)
Hydraulic fluid (item 10, App. A)

PERSONNEL: One

REFERENCES: JPG for procedure to use M3 oil pump
TM 9-2350-257-20-2-3 for procedure to remove replenisher

EQUIPMENT CONDITION: Replenisher removed (TM-20-2-3)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

NOTE

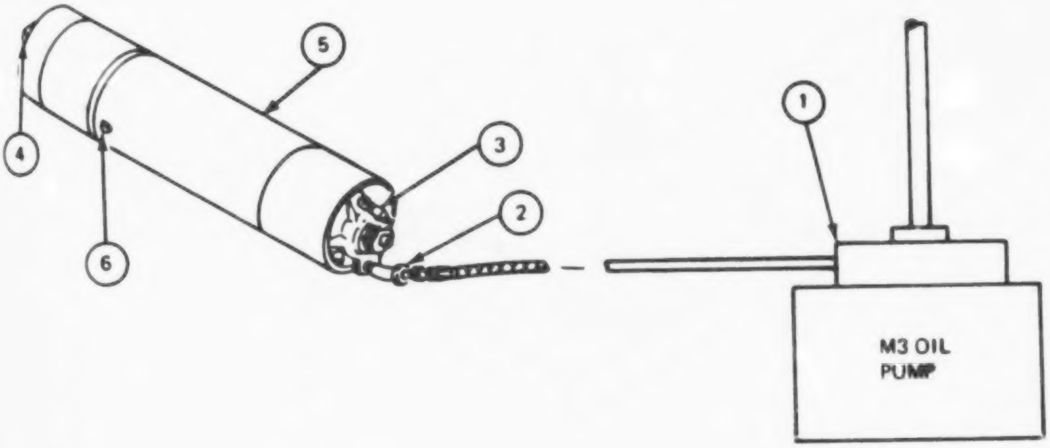
If normal indication is not obtained, replenisher is bad. Refer to section index (para 11-32) for replacement of parts.

Use pan and rags for oil drainage and spills.
Use suitable hydraulic fittings, preformed packings, and tools to connect test equipment to parts being tested.

11-33. REPLENISHER TEST PROCEDURE (CONT)

FRAME 1

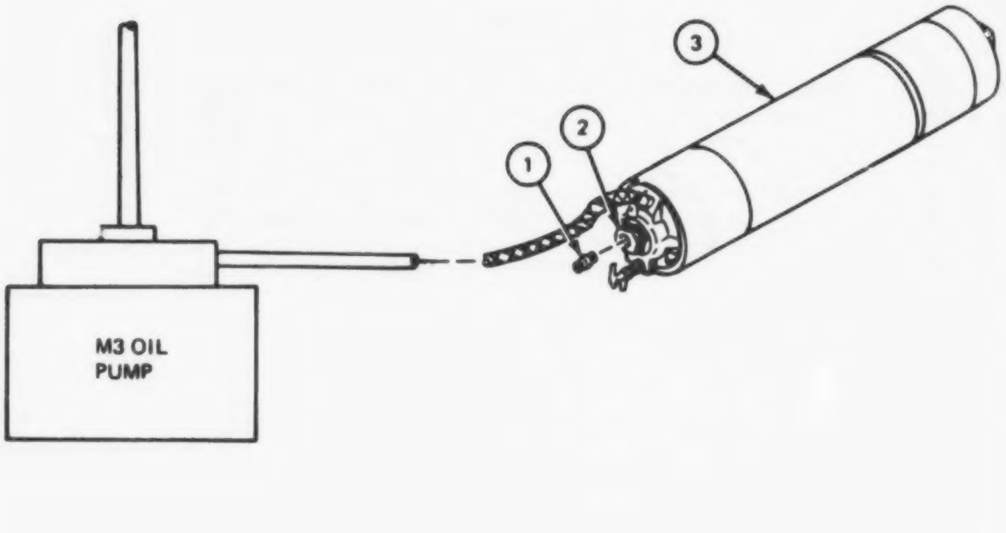
Step	Procedure
1.	Assemble M3 oil pump (1).
2.	Using 9/16" wrench, connect hose from M3 oil pump (1) to elbow (2).
3.	Using hand, close drain cock (3).
	NOTE If indicator (4) tape does not wind up smoothly in indicator, tape may have to be rewound.
4.	Using M3 oil pump (1), fill replenisher (5) until steady stream of oil comes out overflow hole (6) (JPG). Check indicator (4) tape for smooth operation during filling.
5.	Using M3 oil pump (1), reduce pressure until oil stops coming out of overflow hole (6) (JPG).
	GO TO FRAME 2



11-33. REPLENISHER TEST PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using 1/2" wrench, remove plug (1) from valve (2).
2.	Using watch, start timing for 5-minute test.
3.	Check valve (2) for leaks.
	NOTE If valve (2) leaked more than one drop during 5-minute test, valve is bad.
4.	Check replenisher (3) for leaks.
	NOTE If replenisher (3) leaked in step 4, replenisher is bad.
	GO TO FRAME 3



11-33. REPLENISHER TEST PROCEDURE (CONT)

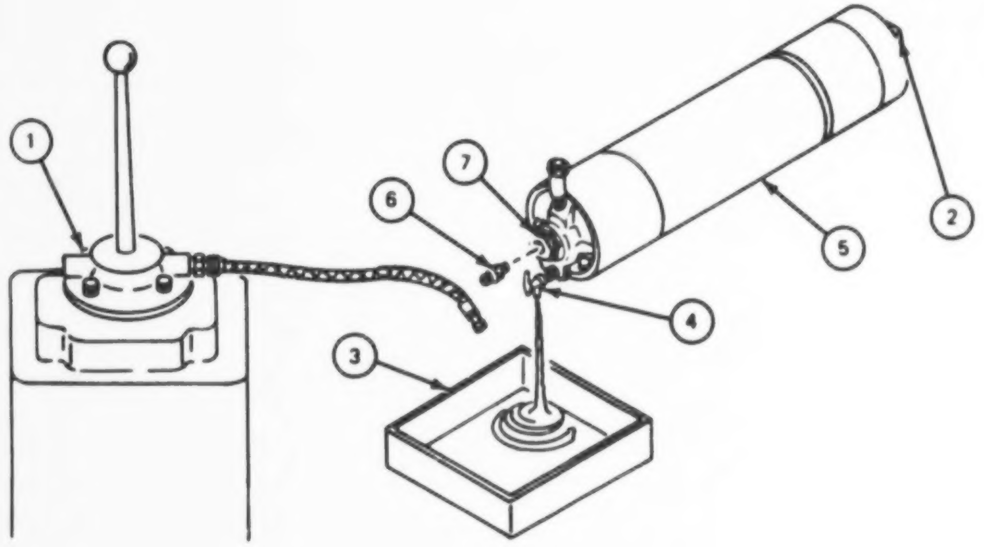
FRAME 3

Step	Procedure
1.	Using M3 oil pump (1), reduce pressure until indicator (2) tape stops unwinding (JPG).
2.	Disconnect M3 oil pump (1) hose.
3.	Using pan (3) to catch oil, open drain cock (4) to drain any remaining oil in replenisher (5). Close drain cock (4).
4.	Using 1/2" wrench, install plug (6) in valve (7).

NOTE

If normal indication was obtained in frames 1, 2, and 3, replenisher is good.

END OF TASK



11-34. REPLENISHER DISASSEMBLY PROCEDURE

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to remove replenisher

EQUIPMENT CONDITION: Replenisher removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test replenisher (para 11-33)

FRAME 1

Step	Procedure
1.	Remove indicator (para 11-36).
2.	Remove head, piston, and tape (para 11-38).
	END OF TASK

11-35. REPLENISHER ASSEMBLY PROCEDURE

PERSONNEL: One

FRAME 1

Step	Procedure
1.	Install head, piston and tape (para 11-39).
2.	Install indicator (para 11-37).
	NOTE Follow-on Maintenance Action Required: Test replenisher (para 11-33).
	END OF TASK

11-36. INDICATOR REMOVAL PROCEDURE

TOOLS: Stiff bristled brush
Scraper
Fine stone
1/4" flat tip screwdriver
5/16" open end wrench

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Clean parts
Inspect and repair parts
TM 9-2350-257-20-2-3 for procedure to remove replenisher

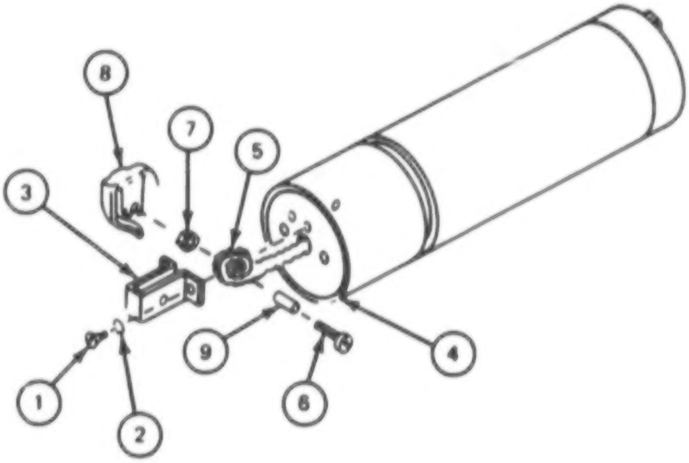
EQUIPMENT CONDITION: Replenisher removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Test replenisher (para 11-33)

11-36. INDICATOR REMOVAL PROCEDURE (CONT)

FRAME 1

Step	Procedure
	WARNING
	Edges of tape are sharp. Be careful when handling tape.
1.	Using screwdriver, remove two screws (1) and two lockwashers (2) that attach bracket (3) to cap (4).
2.	Using hands, pull on bracket (3) until tape (5) is uncoiled.
3.	Using screwdriver and wrench, remove screw (6) and nut (7).
4.	Using hands, separate bracket (3) and guide (8).
5.	Using hands, slide pin (9) from tape (5).
	NOTE
	Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



11-37. INDICATOR INSTALLATION PROCEDURE

TEST EQUIPMENT: M3 oil pump
Suitable hydraulic fittings

TOOLS: 1/4" flat tip screwdriver
5/16" open end wrench
9/16" combination wrench
Needle nose pliers

SUPPLIES: Thin wire (4" long)
Cotter pin

PERSONNEL: One

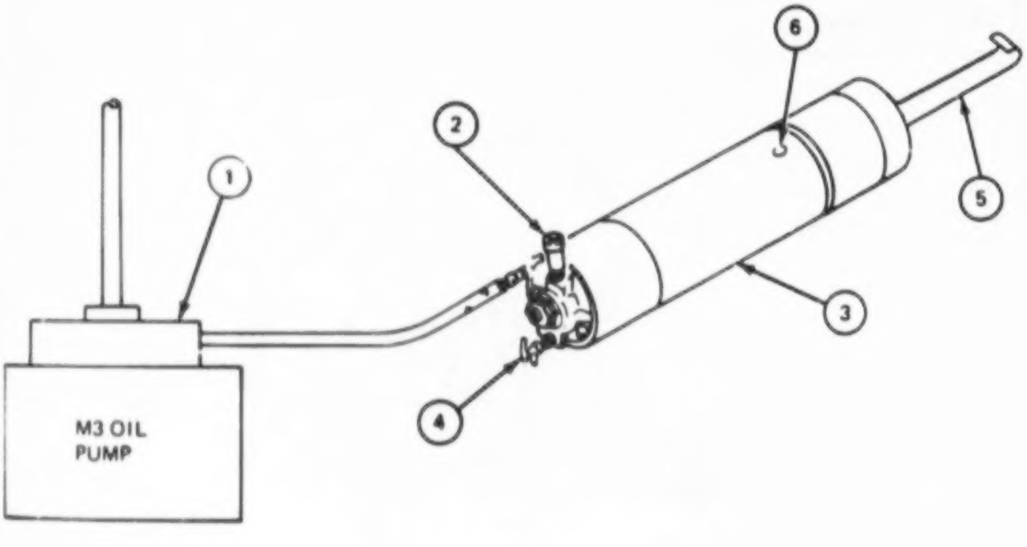
REFERENCES: JPG for procedure to use M3 oil pump

PRELIMINARY PROCEDURES: Install piston and tape (para 11-39)

11-37. INDICATOR INSTALLATION PROCEDURE (CONT)

FRAME 1

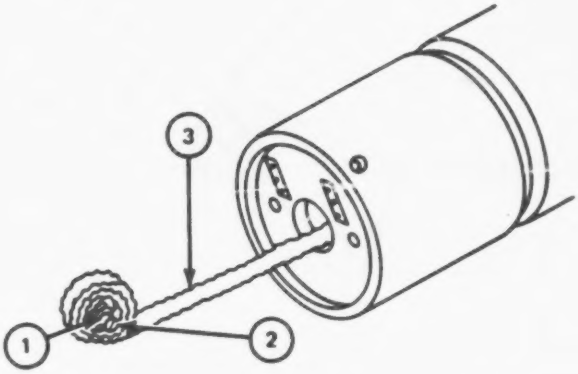
Step	Procedure
1.	Assemble M3 oil pump (1).
2.	Connect M3 oil pump (1) hose to elbow (2) on replenisher (3).
3.	Using hand, close drain cock (4).
4.	Using M3 oil pump (1), fill replenisher (3) until tape (5) with notch cut on both sides comes out of replenisher and oil comes out of overflow hole (6) (JPG).
5.	Using M3 oil pump (1), maintain pressure on replenisher (3) while doing frames 2 and 3 (JPG).
	GO TO FRAME 2



11-37. INDICATOR INSTALLATION PROCEDURE (CONT)

FRAME 2

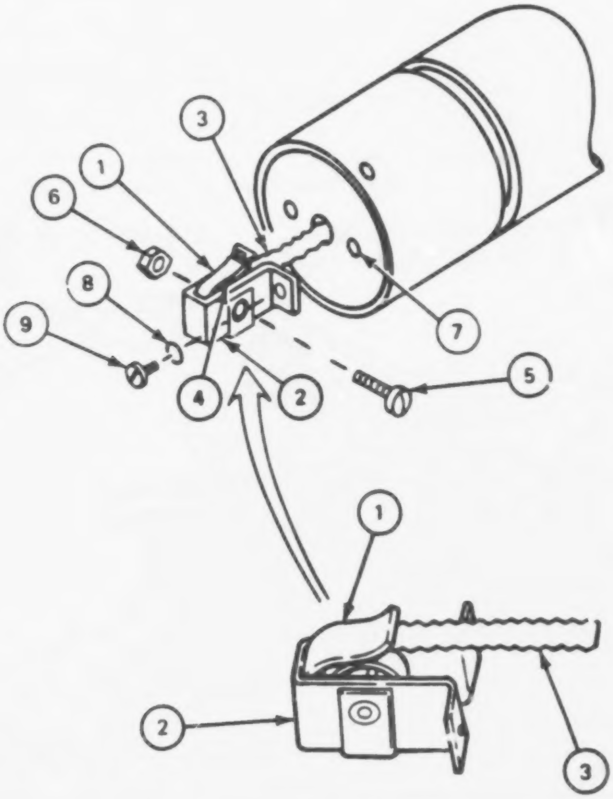
Step	Procedure
	WARNING Edges of tape are sharp. Be careful when handling tape.
1.	Put tape end (1) through slot in pin (2).
2.	Using cotter pin, put one side through hole in pin (2) and wind tape (1) until approximately 1-1/4 inches of tape is showing.
3.	Put thin wire through center of pin (2) and around tape (3). Twist wire until tight around tape (3).
4.	Remove cotter pin. GO TO FRAME 3



11-37. INDICATOR INSTALLATION PROCEDURE (CONT)

FRAME 3

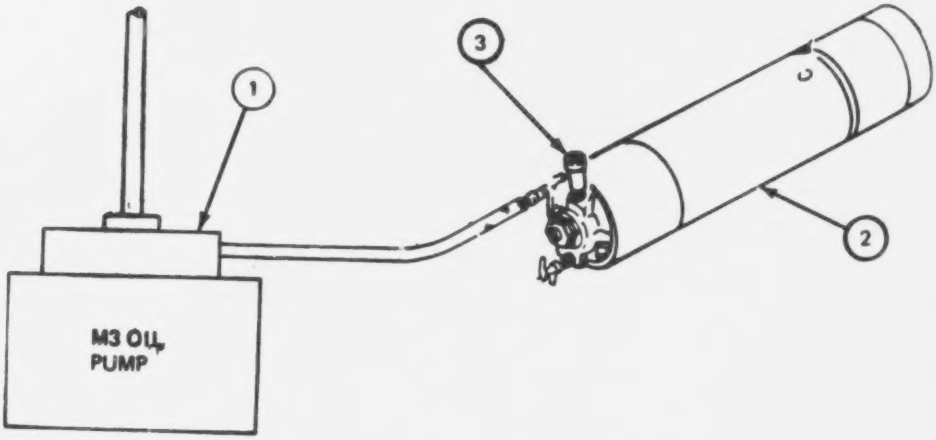
Step	Procedure
1.	Using hands, put guide (1) in bracket (2).
2.	Put coiled tape (3) and pin (4) in guide (1) and bracket (2).
3.	Align hole in pin (4) with holes in guide (1) and bracket (2).
4.	Using screwdriver and 5/16" wrench, install screw (5) and nut (6).
5.	Using pliers, remove wire (used to hold tape (3) in snug ball).
6.	Using screwdriver, attach bracket (2) to cap (7) with two lockwashers (8) and two screws (9).
	GO TO FRAME 4



11-37. INDICATOR INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using M3 oil pump (1), reduce oil pressure on replenisher (2) (JPG).
2.	Disconnect M3 oil pump (1) hose from elbow (3) on replenisher (2).
3.	Disassemble M3 oil pump (1).
	NOTE Follow-on Maintenance Action Required: Test replenisher (para 11-33).
	END OF TASK



11-38. HEAD, PISTON, AND TAPE OR CYLINDER REMOVAL PROCEDURE

TOOLS: 20 ounce ball peen hammer
Center punch
Adjustable face spanner wrench (3/8" diameter pins)
Push rod (fabricated tool, item 11, App. B)
Vise (with brass caps)
1/4" flat tip screwdriver
1/2" combination wrench
8" adjustable wrench
9/16" combination wrench
5/8" combination wrench
15" adjustable wrench
O-ring extractor kit
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Rags (item 21, App. A)
Container
Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: JPG for procedures to:
Remove preformed packings
Remove rivets
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test replenisher (para 11-33)
Remove indicator (para 11-36)

GENERAL INSTRUCTIONS:

CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

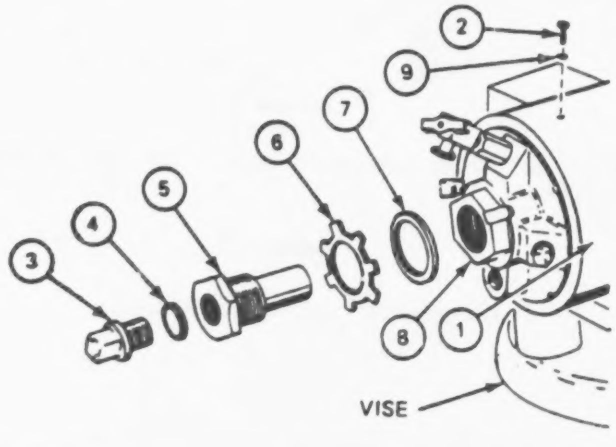
NOTE

Use container and rags for oil spills.

11-38. HEAD, PISTON, AND TAPE OR CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 1

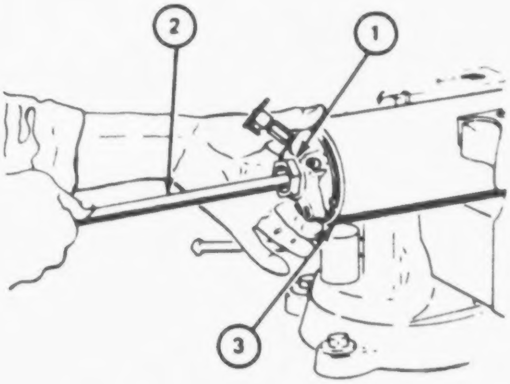
Step	Procedure
1.	Using vise, clamp replenisher (1) in vise jaws with setscrew (2) up.
	CAUTION Make sure setscrew (2) is tight.
	NOTE Washer (4) is not removed from valve (5) unless being replaced.
2.	Using 1/2" combination wrench, remove plug (3) and washer (4) from valve (5).
3.	Using screwdriver, lift bent tangs of key washer (6) from valve (5).
	NOTE Spacer (7) is not removed from head (8) unless being replaced.
4.	Using 15" adjustable wrench, remove valve (5), key washer (6), and spacer (7) from head (8). Throw key washer away.
5.	Using screwdriver, remove setscrew (2) and lockwasher (9) from replenisher cylinder (
	GO TO FRAME 2



11-38. HEAD, PISTON, AND TAPE OR CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 2

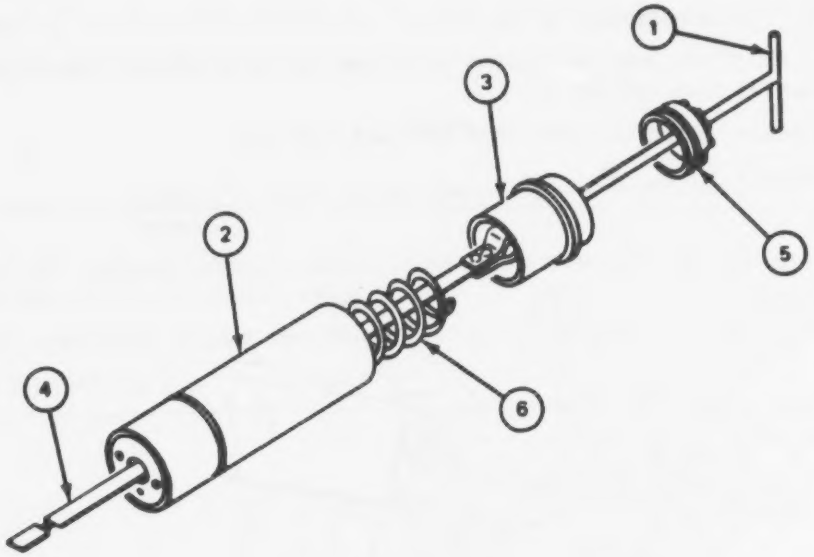
Step	Procedure
	WARNING Spring and piston inside cylinder (3) are kept under tension by head (1). Removal of head must be done carefully to prevent injury by release of spring and piston.
1.	Using 15" adjustable wrench, loosen but do not remove head (1).
2.	Put push rod (2) through hole in head (1).
3.	Pushing on rod (2) to keep pressure on piston and spring in cylinder (3). Use hand to remove head (1) from cylinder (3).
4.	Keeping pressure on rod (2), slide head (3) back onto rod.
	GO TO FRAME 3



11-38. HEAD, PISTON, AND TAPE OR CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 3

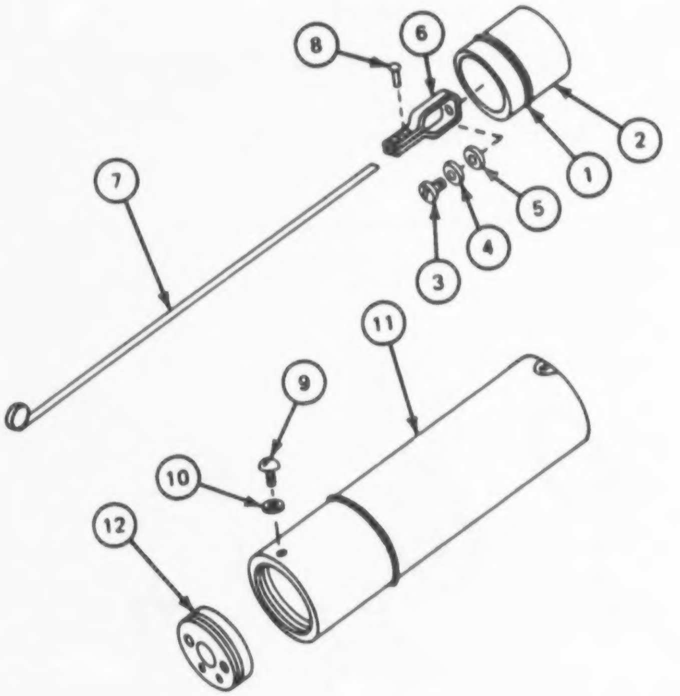
Step	Procedure
1.	Slowly remove push rod (1) from cylinder (2).
2.	Using hands, remove piston (3) and tape (4) from cylinder (2).
3.	Remove head (4) from push rod (1).
4.	Remove spring (6) from cylinder (2).
	GO TO FRAME 4



11-38. HEAD, PISTON, AND TAPE OR CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Using O-ring extractor tool, remove seal assembly (1) from piston (2) (JPG). Throw away seal.
2.	Using screwdriver, remove screw (3), lockwasher (4), sleeve bearing (5), clamp (6), and tape (7) from piston (2).
3.	Using hammer and punch, remove two rivets (8) and tape (7) from clamp (6) (JPG).
4.	Using screwdriver, remove setscrew (9) and lockwasher (10) from cylinder (11).
5.	Using spanner wrench, remove cap (12) from cylinder (11).
	GO TO FRAME 5

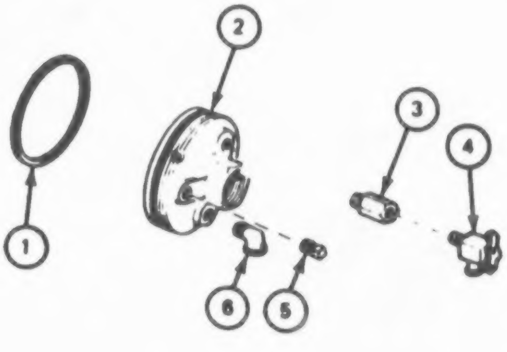


Para 11-38 Cont

11-38. HEAD, PISTON, AND TAPE OR CYLINDER REMOVAL PROCEDURE (CONT)

FRAME 5

Step	Procedure
1.	Using O-ring extractor tool, remove preformed packing (1) from head (2) (JPG). Thro away preformed packing.
	NOTE It may be necessary to put nut part of head (2) in vise.
2.	Using 5/8" wrench on coupling (3) and 9/16" wrench on drain cock (4), remove drai cock from coupling.
3.	Using 5/8" wrench, remove coupling (3) from head (2).
4.	Using 8" adjustable wrench, remove two plugs (5) from head (2).
5.	Using 8" adjustable wrench, remove elbow (6).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG).
	END OF TASK



11-39. HEAD, PISTON, AND TAPE OR CYLINDER INSTALLATION PROCEDURE

TOOLS: Vise (with brass caps)
Adjustable face spanner wrench (3/8" pins)
Push rod (fabricated tool, item 11, App. B)
1/4" flat tip screwdriver
1/2" combination wrench
9/16" combination wrench
5/8" combination wrench
15" adjustable wrench
8" adjustable wrench
20 ounce ball peen hammer
3/16" drive pin punch
O-ring extractor kit

SUPPLIES: Preformed packing (MS 28775-338)
Key washer (5238398)
Shim stock, 1/2" by 5", 0.005" thick (four)
Seal (8449047)
Rivets (MS16535-68) (two)
Grease (item 12, App. A)
Hydraulic fluid (item 10, App. A)

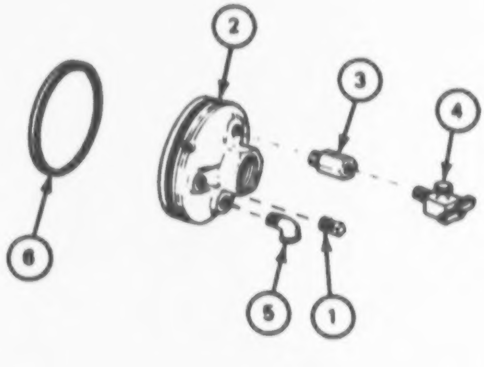
PERSONNEL: One

REFERENCES: JPG for procedures to:
Install preformed packings
Install rivets

11-39. HEAD, PISTON, AND TAPE OR CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 1

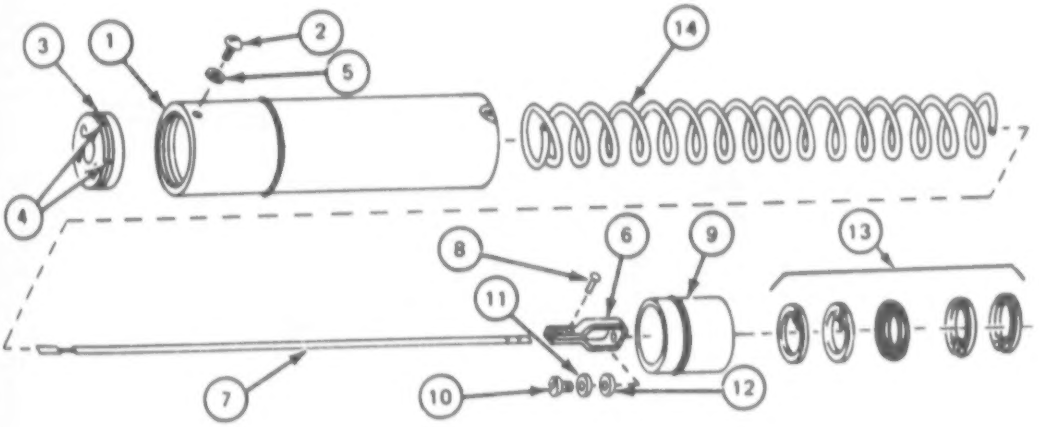
Step	Procedure
	NOTE It may be necessary to put nut part of head (2) in vise.
1.	Using 8" adjustable wrench, put two plugs (1) in head (2).
2.	Using 5/8" combination wrench, install coupling (3) in head (2).
3.	Using 9/16" combination wrench, put drain cock (4) in coupling (3).
4.	Using 8" adjustable wrench, put elbow (5) in head (2).
5.	Put light coat of hydraulic fluid on preformed packing (6).
6.	Using O-ring extractor tool, put preformed packing (6) on head (2) (JPG).
	GO TO FRAME 2



11-39. HEAD, PISTON, AND TAPE OR CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 2

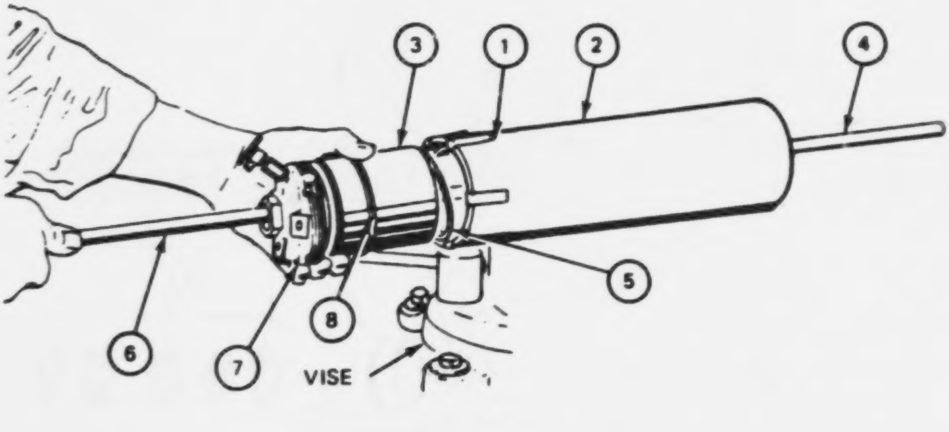
Step	Procedure
1.	Put cylinder (1) in vise with setscrew (2) hole up.
2.	Using spanner wrench, tighten cap (3) until flush with end of cylinder (1).
3.	Using spanner wrench, tighten (or loosen) cap (3) until nearest of four slots (4) in cap is in line with setscrew (2) hole.
4.	Using screwdriver, put setscrew (2) and lockwasher (5) in cylinder (1).
5.	Using hammer, attach clamp (6) to tape (7) with two rivets (8) (JPG).
6.	Using screwdriver, attach clamp (6) with tape (7) to piston (9) with screw (10), lockwasher (11), and sleeve bearing (12).
7.	Put light coat of hydraulic fluid on seal (13).
	NOTE Breaks in seal assembly (13) should be 180 degrees apart.
8.	Using O-ring extractor tool, put seal assembly (13) on piston (9) (JPG).
9.	Put spring (14) in cylinder (1).
	GO TO FRAME 3



11-39. HEAD, PISTON, AND TAPE OR CYLINDER INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	CAUTION Shims (1) must be used during installation of piston (3) to prevent damage to piston seal (8). Coat shims with grease to hold in place.
1.	Bend four shims (1) around cylinder (2) opening to cover threads inside.
2.	Put piston (3) and tape (4) in cylinder (2) and guide tape through center of spring (5) and center of cap installed in end of cylinder. Put piston over spring.
3.	Put push rod (6) through hole in head (7). Position head against piston (3).
4.	Pushing rod (6) in against piston (3) and spring (5), slowly guide piston (3) into cylinder (2) until piston seal (8) is inside cylinder (2).
5.	Holding piston in with push rod (6), remove four shims (1).
6.	Using hands, screw head (7) in cylinder (2). Remove push rod (6).
	GO TO FRAME 4



-39. HEAD, PISTON, AND TAPE OR CYLINDER INSTALLATION PROCEDURE (CONT)

RAME 4

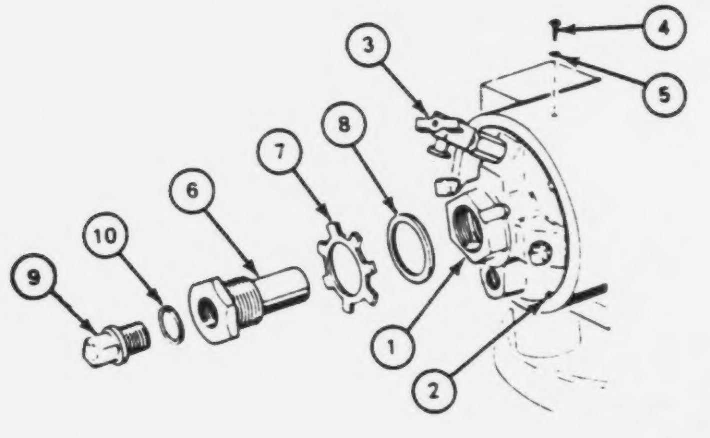
tep	Procedure
1.	Using 15" adjustable wrench, tighten head nut (1) until head is approximately flush with end of cylinder (2) and drain cock (3) is at bottom.
2.	Using 15" adjustable wrench, tighten (or loosen) head (1) until nearest of four slots in head is in line with setscrew (4) hole.
3.	Using screwdriver, put setscrew (4) and lockwasher (5) in cylinder (2).
4.	Using 15" adjustable wrench, put valve (6), new key washer (7), and spacer (8) in head nut (1).
5.	Using hammer and punch, bend one tang of key washer (7) down in groove in head (1) nut and six tangs down on valve nut (6).
6.	Using 1/2" wrench on plug (9) and 15" adjustable wrench on valve nut (6), put plug (9) and flat washer (10) in valve nut.

NOTE

Follow-on Maintenance Action Required:

Install indicator (para 11-37).
Test replenisher (para 11-33).

END OF TASK



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CHAPTER 12

CUPOLA

Section 1. SCOPE

2-1. LIST OF EQUIPMENT ITEMS CONTAINED IN THIS CHAPTER

Section	Equipment Item	Paragraph
2	Cupola	12-2
3	Cupola Bearing Components	12-5
4	Cuploa Azimuth Gear Box	12-11
5	Elevating Screw Jack	12-17

Section 2. CUPOLA

12-2. MAINTENANCE PROCEDURES INDEX

Equipment Item	Tasks	
	Removal	Installation
Cupola	12-3	12-4

12-3. CUPOLA REMOVAL PROCEDURE

TOOLS: Hoist (2 ton minimum capacity)
Sling (NSN 4933-00-480-5662)
3/4" drive breaker bar
Cupola adapaters A and B (fabricated tool, item 4, App. B)

SUPPLIES: 6" x 6" x 36" wood blocks (two)

PERSONNEL: Three

REFERENCES: TM 9-2350-257-10 for procedures to:
- Close and lock cupola hatch
- Remove cal .50 machine gun
- Remove M36 periscope

TM 9-2350-257-20-2-3 for procedures to:
- Remove ammunition box
- Remove cupola azimuth gear box

EQUIPMENT LOCATION INFORMATION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10

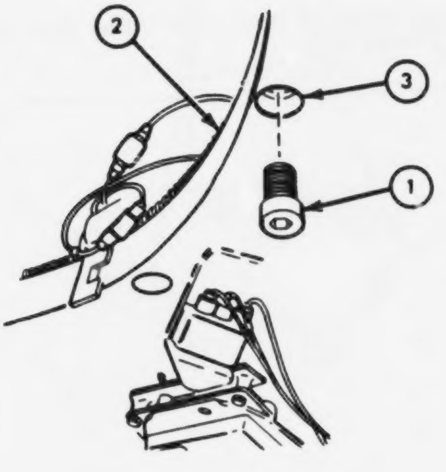
EQUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Cal .50 machine gun removed (TM-10)
M36 periscope removed (TM-10)
Ammunition box removed (TM-20-2-3)
Cupola azimuth gear box removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove cupola guards (para 9-2, 9-4 and 9-6)
Remove wiring harness (10873607) (para 8-14, frame 1, steps 5 and 8, and frame 2, steps 1,4,5, 6,7, and 8)
Remove wiring harness (10911240) (para 8-16, step 3)
Remove cupola support, plate, and rubber strip (para 9-8)

3. CUPOLA REMOVAL PROCEDURE (CONT)

AME 1

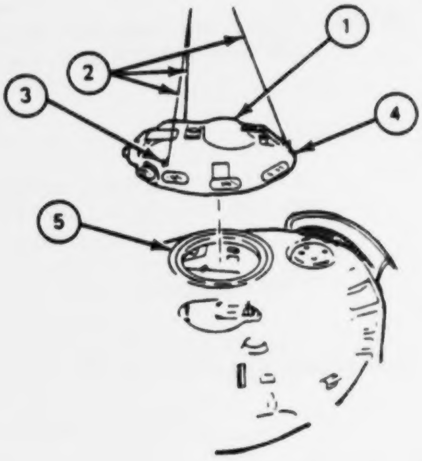
ep	Procedure
	NOTE Adapter A is used to remove two cupola spur gear attaching screws from turret roof over rangefinder. Adapter B is used to remove other ten cupola spur gear attaching screws.
1.	Using adapter A and breaker bar, remove two screws (1) over rangefinder, that attach cupola spur gear (2) to turret roof (3).
2.	Using adapter B and breaker bar, remove other ten screws (1) that attach cupola spur gear (2) to turret roof (3). GO TO FRAME 2

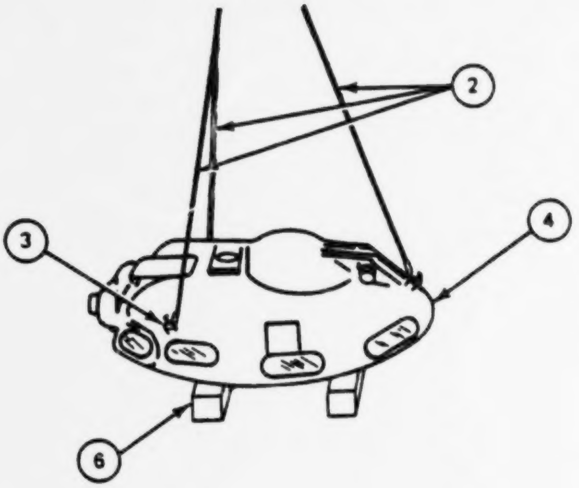


12-3. CUPOLA REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Soldier A: Close and lock cupola hatch (1) (TM-10).
2.	Soldier B: Attach sling (2) to three lifting eyes (3) on roof of cupola (4).
	WARNING Cupola weighs one ton. Soldiers must stay clear of cupola when it is being lifted or moved by hoist to keep from getting hurt.
3.	Soldiers A and B: Guide cupola (4) as it is being lifted from turret roof (5).
4.	Soldier C: Using hoist, lift cupola (4) from turret roof (5).
5.	Soldier C: Using hoist, lower cupola (4) near ground.
6.	Soldiers A and B: Put wood blocks (6) under cupola (4).
7.	Soldier C: Using hoist, lower cupola (4) onto wood blocks (6).
8.	Soldiers A and B: Remove sling (2) from three lifting eyes (3) on roof of cupola (4).
	END OF TASK





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. CUPOLA INSTALLATION PROCEDURE

LS: Hoist (2 ton minimum capacity)
Sling (NSN 4933-00-480-5662)
3/4" drive breaker bar
Cupola adapters A and B (fabricated tool, item 4, App. B)
3/4" drive torque wrench (0 to 420 foot-pounds)

SONNEL: Three

FERENCES: JPG for procedure to use torque wrench
TM 9-2350-257-20-2-3 for procedures to:
Install cupola azimuth gear box
Install ammunition box
TM 9-2350-257-10 for procedures to:
Install M36 periscope
Install cal .50 machine gun
Check electrical and mechanical operation of cupola

UIPMENT LOCATION INFORAMTION:

EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10

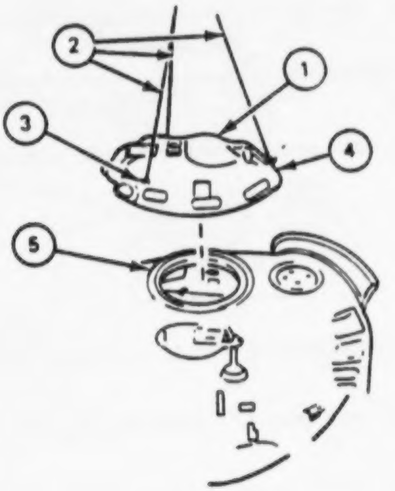
UIPMENT CONDITION: Driver's master control panel MASTER BATTERY swtich set to OFF

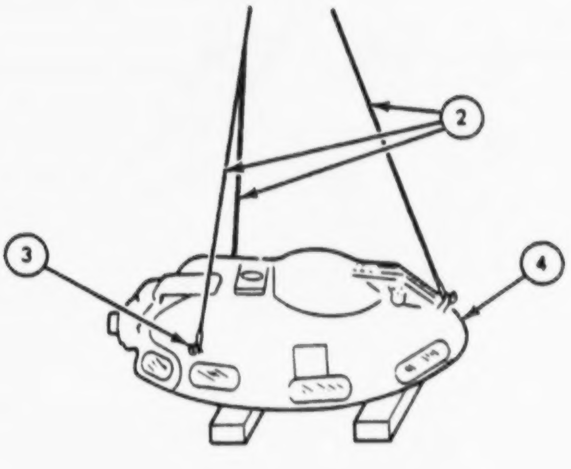
RELIMINARY PROCEDURES: Install cupola bearing components (para 12-10)

12-4. CUPOLA INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Soldier A: Check that cupola hatch (1) is locked.
2.	Soldier B: Attach sling (2) to three lifting eyes (3) on roof of cupola (4).
	WARNING Cupola weighs one ton. Soldiers must stay clear of cupola when it is being lifted or moved by hoist, to keep from getting hurt.
3.	Soldiers A and B: Guide cupola (4) as it is being lifted onto turret roof (5).
4.	Soldier C: Using hoist, lift cupola (4) over turret roof (5), and lower to about 6" above cupola opening in turret roof.
	GO TO FRAME 2

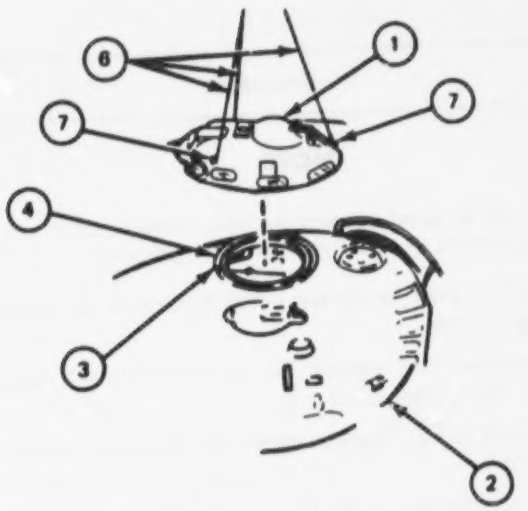


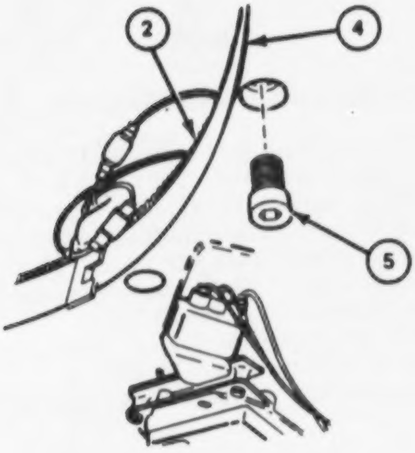


12-4. CUPOLA INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Soldier A: Get inside turret.
2.	Soldier B: Guide cupola (1) into position from outside cupola.
	WARNING Do not get fingers between cupola and turret roof. They could get hurt.
3.	Soldier A: Using hands, turn spur gear (2) until locating pin hole is lined up with locating pin (3) on turret roof (4).
4.	Soldier C: Using hoist, slowly lower cupola (1) to within 1/4" of turret roof (4).
5.	Soldier A: Start 12 screws (5) that attach spur gear (2) to turret roof (4).
6.	Soldier C: Using hoist, lower cupola (1) to turret roof (4).
7.	Soldier B: Remove sling (6) from three lifting eyes (7) on roof of cupola (1). GO TO FRAME 3

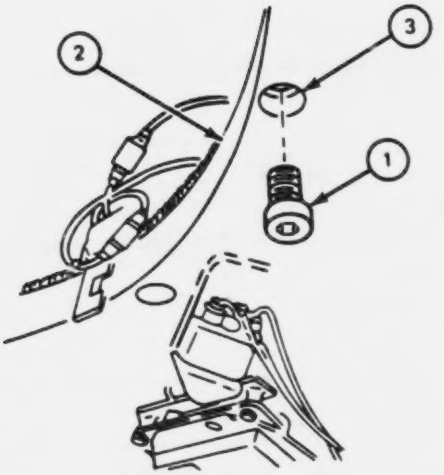




12-4. CUPOLA INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
	NOTE Adapter A is used to tighten two cupola spur gear attaching screws in turret roof over rangefinder. Adapter B is used to tighten other 10 cupola spur gear attaching screws.
1.	Using adapter A and breaker bar, tighten two screws (1) over rangefinder, that attach cupola spur gear (2) to turret roof (3).
2.	Using adapter B and breaker bar, tighten other 10 screws (1) that attach cupola spur gear (2) to turret roof (3).
3.	Using torque wrench and adapters A and B, torque screws (1) between 270 and 280 foot-pounds (JPG).
	NOTE Follow-on Maintenance Action Required: Install cupola azimuth gear box (TM-20-2-3). Install wiring harness (10911240). (par 8-17, step 2). Install wiring harness (10873607) (para 8-15, frame 1, steps 1,2,3,4,5, and 10, and frame 2, steps 3 and 6). Install cupola guards (para 9-3, 9-5, 9-7). Install cupola support, plate, and rubber strip (para 9-8). Install ammunition box (TM-20-2-3). Install M36 periscope (TM-10). Install cal. 50 machine gun (TM-10). Check electrical and mechanical operation of cupola (TM-10).
	END OF TASK



Section 3. CUPOLA BEARING COMPONENTS

12-5. MAINTENANCE PROCEDURES INDEX

			Tasks		
Equipment Item	Inspection	Test	Adjustment	Removal	Installation
Cupola Bearing Components	12-6	12-7	12-8	12-9	12-10

12-6. CUPOLA BEARING COMPONENTS INSPECTION PROCEDURE

PERSONNEL: Two

PRELIMINARY PROCEDURES: Remove cupola bearing components (para 12-9)

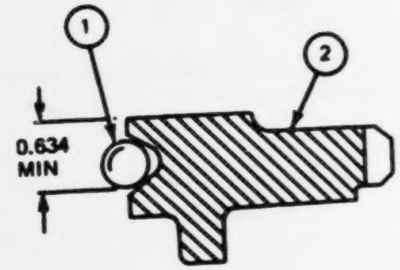
GENERAL INSTRUCTIONS:

NOTE

If part is bad, order repair part or next higher assembly as required.

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take bearing balls (1) and spur gear (2) to shop where precision inspection equipment is available.
	a. Check bearing balls for ball with diameter of 0.406 inch.
	b. Using 0.406 inch bearing ball (1) seated in bearing race, measure from top surface of spur gear (2) to bottom of ball. Measurement must be between 0.636 ±.002 inches. Repeat at several places around spur gear.
	c. Tag parts that are out of tolerance.
2.	After support shop work, return parts to turret shop.
	END OF TASK


1
2
0.634
MIN

12-7. CUPOLA BEARING COMPONENTS TEST PROCEDURE

TOOLS: Spring scale (0 to 10 pounds capacity)
Dial indicator with magnetic base holder and connecting rods

SUPPLIES: Screw 9406897 (spur gear to turret roof attach screw)
String (about 3 feet)

PERSONNEL: Two

REFERENCES: JPG for procedure to use spring scale

PRELIMINARY PROCEDURES: Remove cupola (para 12-3)
Set cupola upside down on wood blocks (para 12-9, frames 1 and 2).

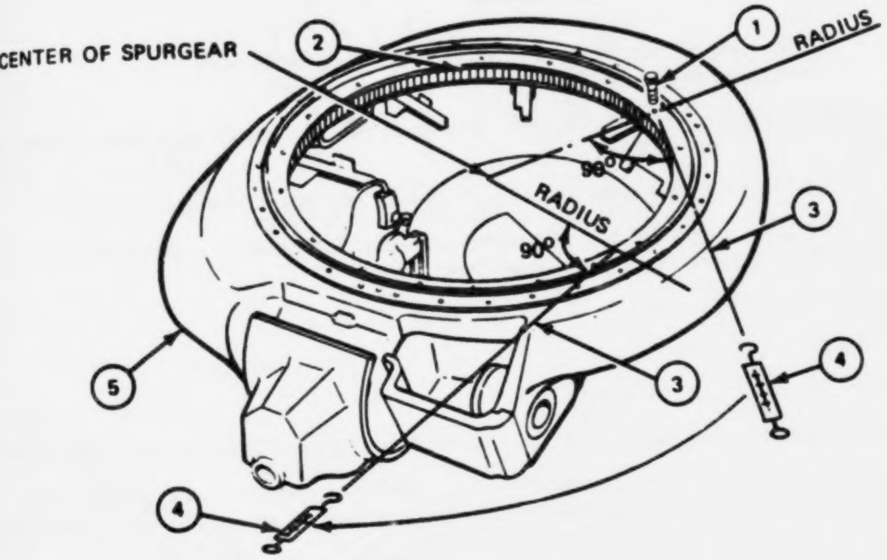
GENERAL INSTRUCTIONS:

NOTE

A support shop work team with precision measuring tools is required for this procedure.

FRAME 1

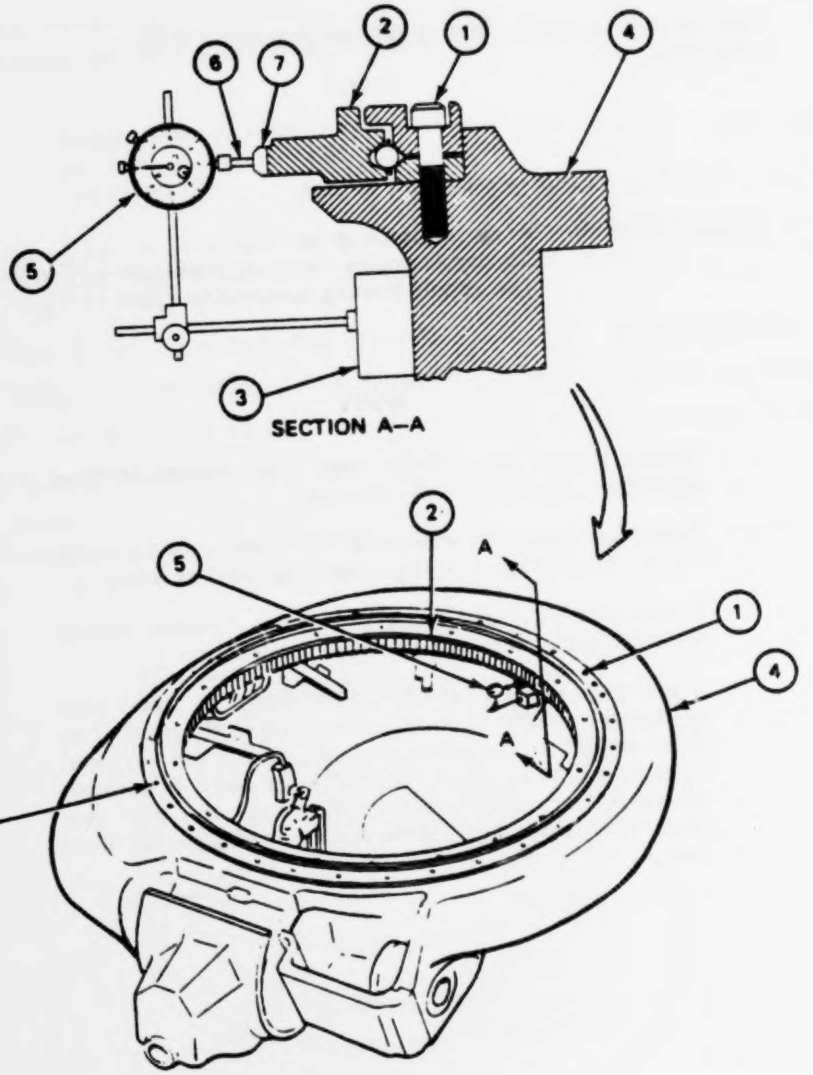
Step	Procedure
1.	Soldier A: Put attach screw (1) in spur gear (2).
2.	Soldier A: Tie one end of string (3) to screw (1).
3.	Soldier A: Tie other end of string (3) to spring scale (4). **NOTE** Soldier A: Watch spring scale (4) indications while Soldier B pulls on spring scale. After start of movement of spur gear (2), spring cable should show less than 3-3/4 pounds. Pull at any place during one complete turn of spur gear (2). Mark any places where high spring scale indications are found. There should be no noises other than normal bearing noise and spur gear should move smoothly.
4.	Soldier B: With spring scale (4) kept at an angle of 90 degrees of radius of spur gear (2), pull evenly, and walk around cupola (5) until spur gear has completed full turn (JPG).
5.	Soldiers A and B: Remove screw (1), string (3) and spring scale (4). **NOTE** If bad indications are found, tag cupola for repair, and continue test. GO TO FRAME 2


CENTER OF SPURGEAR
2
1
RADIUS
90°
RADIUS
90°
3
3
4
5
4

12-7. CUPOLA BEARING COMPONENTS TEST PROCEDURE (CONT)

FRAME 2

Step	Procedure
	SUPPORT SHOP WORK
	NOTE This part of test requires support shop work team with precision measuring tools.
1.	Soldier A: Using hands on screw (1), pull spur gear (2) to outside and hold during steps 2 through 4.
2.	Soldier B: Attach magnetic base holder (3) to cupola (4) even with screw (1).
3.	Soldier B: Using rods, universal rod connector and dial indicator (5), put indicator contact point (6) in contact with spur gear tooth (7).
4.	Soldier B: Set dial indicator (5) to 0.
5.	Soldier A: Release spur gear (2).
6.	Soldier A: Go to other side of cupola (4).
7.	Soldier A: Using hands on opposite screw (1), pull spur gear (2) to outside and hold.
8.	Soldier B: Read indication of dial indicator (5). Indication should be no greater than 0.003". If indication is greater than 0.003", mark race ring at screw (1) for adjustment.
9.	Repeat steps 1 through 8 at every 5th screw (1) around cupola (4).
	NOTE If bad indications are found, tag cupola for adjustment (para 12-8).
	END OF TASK


SECTION A–A
A
A

12-8. CUPOLA BEARING COMPONENTS ADJUSTMENT PROCEDURE

TOOLS: 5/16" hex head socket (3/8" drive)
3/8" drive ratchet
3/8" drive torque wrench (0 to 600 pounds)

SUPPLIES: Used self locking screws (from lower race ring removal for jackscrews)

PERSONNEL: Two

REFERENCES: JPG for procedure to use torque wrench

PRELIMINARY PROCEDURES: Remove cupola (para 12-3)
Set cupola upside down on blocks (para 12-9, frames 1 and 2)
Test cupola bearing components (para 12-7)

GENERAL INSTRUCTIONS:

NOTE

During testing (para 12-7), areas were marked showing tightness or looseness of the spur gear.

Shims are made in thicknesses of 0.002", 0.005", and 0.010". Combinations of these shims are used as required.

If spur gear is too tight (para 12-7, frame 1) shims must be added or changed to next thickness combination.

If spur gear is too loose (para 12-7, frame 2), shims must be changed to next thinnest combination or removed. If no shims are left to be removed and spur gear is still too loose, try removing shim about 15 screw holes away. If this does not tighten spur gear, remove ring races and spur gear (para 12-9) and check them for wear. Replace all worn parts.

CUPOLA BEARING COMPONENTS ADJUSTMENT PROCEDURE (CONT)

E 1

Procedure

Soldier A: Using hex head socket, remove thirty lower race ring screws (1).

NOTE

> Tighten three jackscrews evenly so lower race ring does not bind in cupola. Use three screws (1) for three jackscrews (2).

Soldier A: Using hex head socket, put three jackscrews (2) in three threaded holes of lower race ring (3). Tighten jackscrews enough so fingers can get under inner lip of lower race ring.

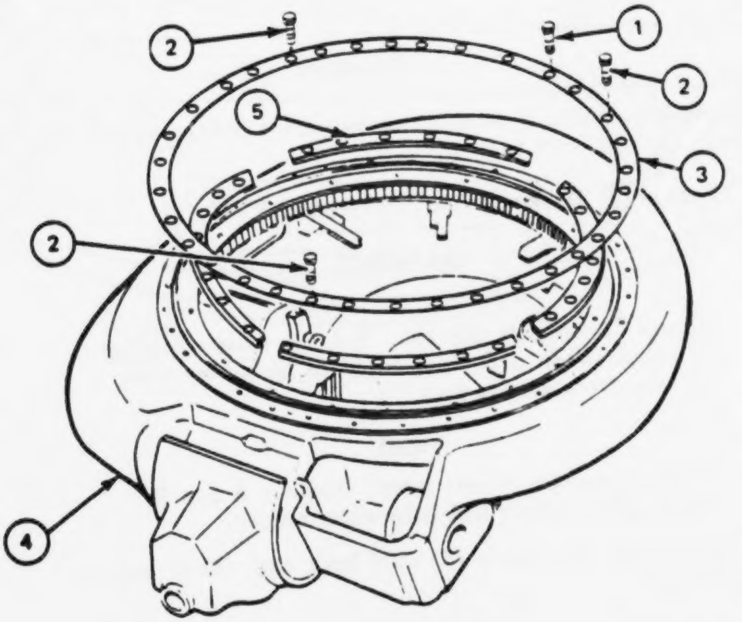
Soldiers A and B: Lift lower race ring (3) from cupola (4).

Soldier A: Remove or add shims (5) as required (see notes in general instructions).

Install lower race ring (para 12-10, frame 4, and frame 5 steps 1 through 3 only).

Do cupola bearing components test (para 12-7).

END OF TASK



12-9. CUPOLA BEARING COMPONENTS REMOVAL PROCEDURE

TOOLS:
- Hoist (2 ton capacity minimum)
- Sling (NSN 4933-00-480-5662)
- 5/16" hex head socket (3/8" drive)
- 3/8" drive ratchet
- Metal scribe
- Scraper
- Stiff bristled brush
- Fine stone

SUPPLIES:
- Masking tape, 1" wide (item 36, App. A)
- Wood block, 6" x 6" x 36"
- Rags (item 21, App. A)
- Pencil
- Dry cleaning solvent (item 33, App. A)
- Crocus cloth (item 7, App. A)
- Rope (1/2" x 24' long)

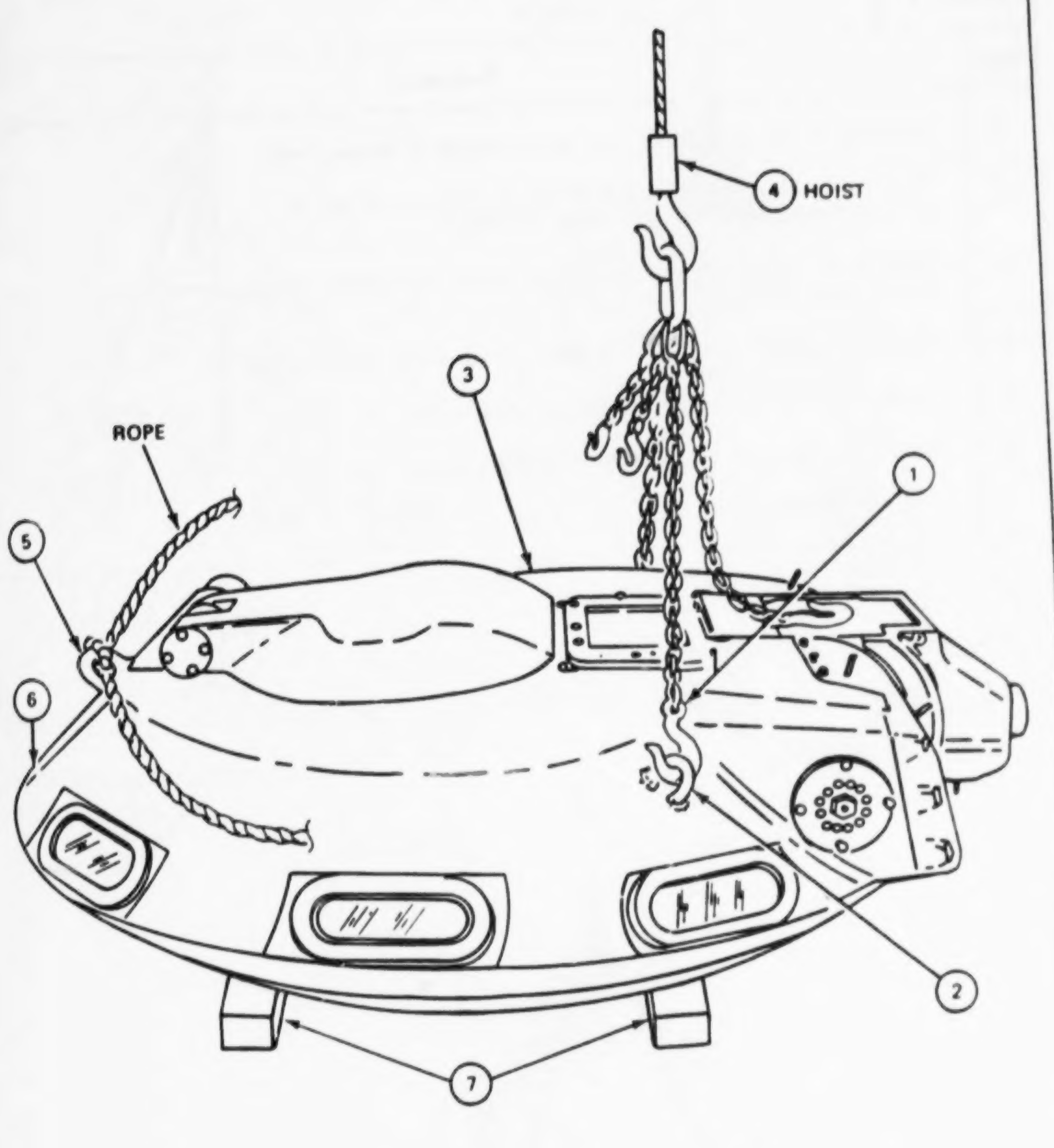
PERSONNEL: Three

REFERENCES: JPG for procedures to:
- Clean parts
- Inspect and repair parts

PRELIMINARY PROCEDURES:
- Remove cupola (para 12-3)
- Test cupola bearing components (para 12-7)

FRAME 1

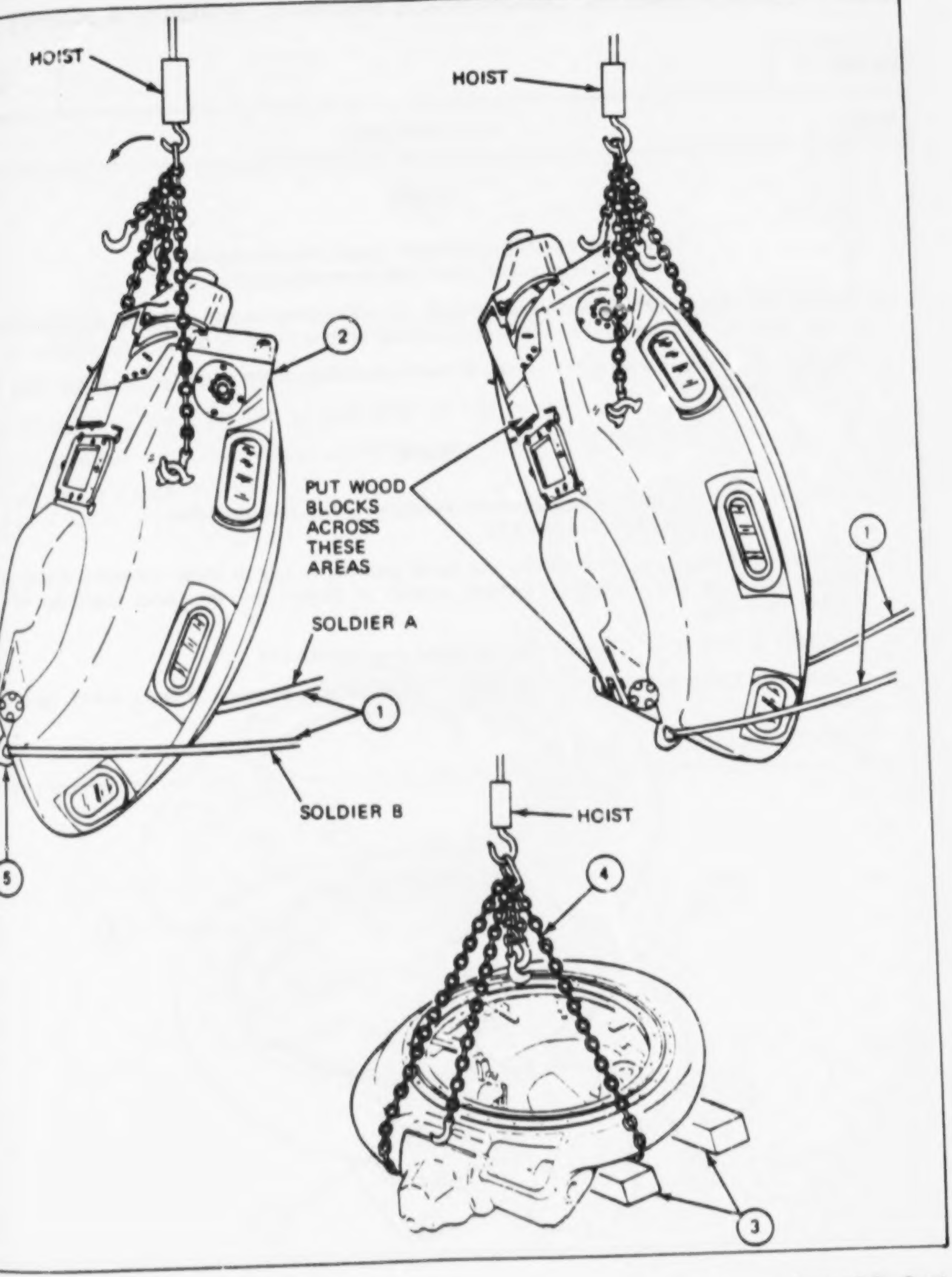
Step	Procedure
1.	Soldier A: Attach two legs of sling (1) to two front lifting eyes (2) on roof of cupola (3) and hoist (4).
2.	Soldier B: Tie rope (at center of rope) to lifting eye (5).
	WARNING Cupola (3) weights one ton. Soldiers must stay clear of cupola when it is being lifted or moved by hoist to keep from getting hurt.
	NOTE Soldier C should operate hoist. Soldiers A and B should guide cupola and help when needed.
3.	Soldiers C: Using hoist, lift cupola (3) until back edge (6) of cupola (3) is touching floor.
4.	Soldiers A and B: Remove two wood blocks (7) from under cupola (3).
	GO TO FRAME 2


4 HOIST
ROPE

12-9. CUPOLA BEARING COMPONENTS REMOVAL PROCEDURE (CONT)

FRAME 2

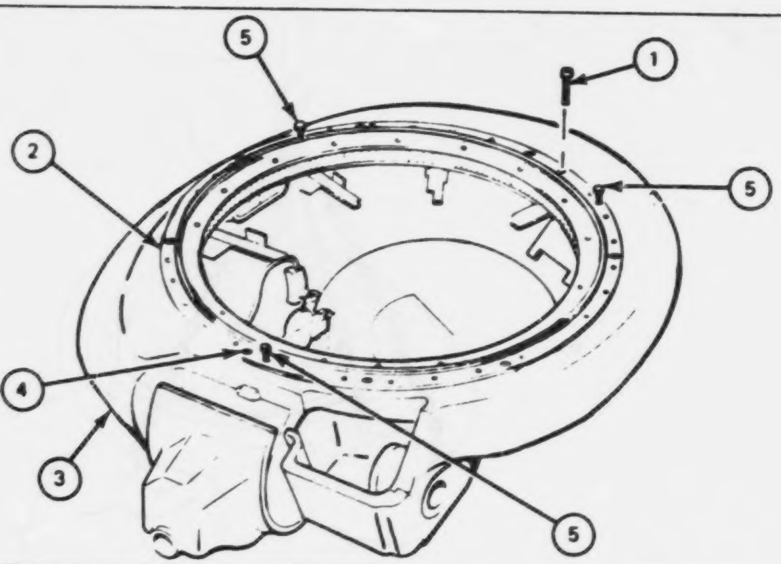
Step	Procedure
1.	Soldiers A and B: Pull on rope while Soldier C lowers hoist.
2.	Soldiers C: Start lowering cupola (2) in direction of arrow toward ground with top of cupola (2) down.
3.	Soldiers A and B: Position two wood blocks (3) under cupola (2) in areas shown.
4.	Soldier C: Using hoist, lower cupola (2) on wood blocks (3).
5.	Soldiers A and B: Remove sling (4) from cupola (2).
6.	Soldier A: Remove rope (1) from lifting eye (5).
	GO TO FRAME 3


HOIST
②
SOLDIER A
①
SOLDIER B
⑤
HOIST
PUT WOOD BLOCKS ACROSS THESE AREAS
①
HCIST
④
③

12-9. CUPOLA BEARING COMPONENTS REMOVAL PROCEDURE (CONT)

FRAME 3

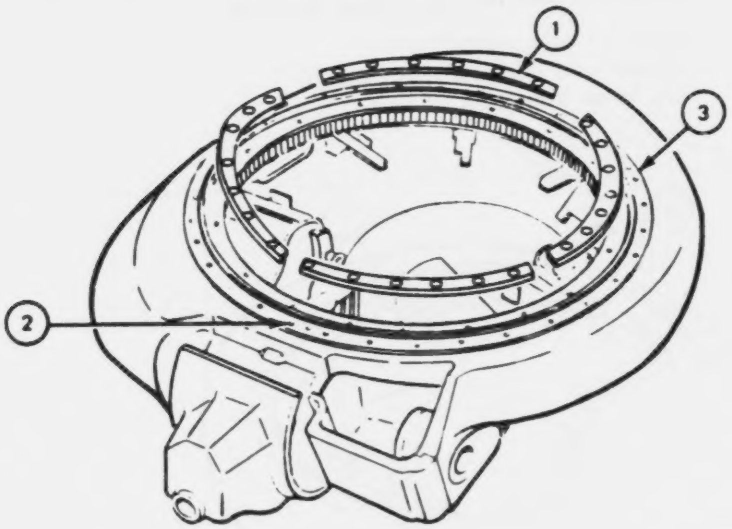
Step	Procedure
	NOTE Save six screws (1) removed in step 1 for use as jacking screws for removal of lower and upper race rings.
1.	Soldier A: Using hex head socket, remove 30 self-locking screws (1) that attach lower race ring (2) to cupola (3). Throw self-locking screws away.
2.	Soldier B: Using metal scribe, mark forward centerline screw hole (4) of lower race ring (2) to cupola (3).
	NOTE Tighten three jackscrews evenly so lower race ring does not bind in cupola (3).
3.	Soldier A: Using hex head socket, put three jackscrews (5) in three threaded holes of lower race ring (2). Tighten jackscrews enough so fingers can get under inner lip of lower race ring.
4.	Soldiers A and B: Lift lower race ring (2) from cupola (3).
5.	Soldier C: Using hex head socket, remove three jacking screws (5) from lower race ring (2).
	GO TO FRAME 4



CUPOLA BEARING COMPONENTS REMOVAL PROCEDURE (CONT)

AME 4

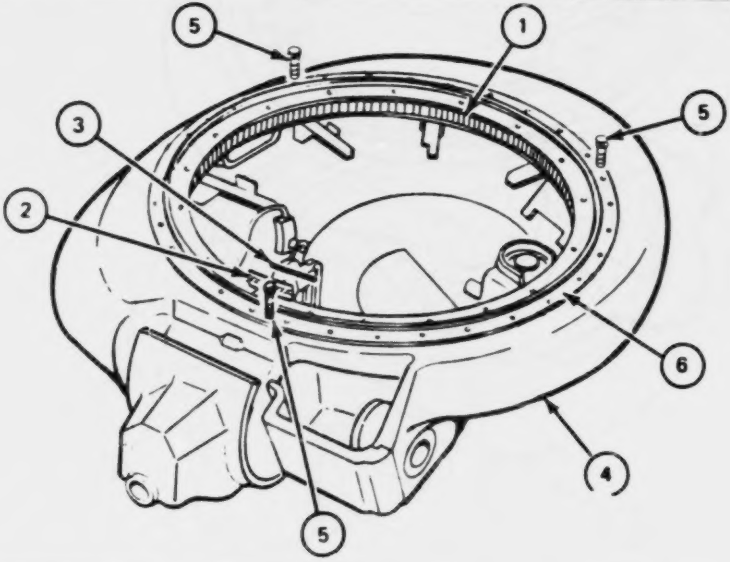
P	Procedure
	NOTE Screw holes are counted clockwise, starting with cupola front centerline screw hole.
.	Using pencil and paper, write screw hole location and number of shims in shim set (1) to help during assembly.
.	Carefully remove and tape together shim sets (1).
.	Using pencil, mark location of each shim set (1) on tape.
.	Using metal scribe, mark front centerline screw hole (2) of upper race ring (3).
	GO TO FRAME 5



12-9. CUPOLA BEARING COMPONENTS REMOVAL PROCEDURE (CONT)

FRAME 5

Step	Procedure
	NOTE Soldiers A and B: Slightly raise spur gear (1) until step 1 is completed.
1.	Soldier C: Remove bearing retainer (2) and bearings (3).
2.	Soldiers A and B: Remove spur gear (1) from cupola (4).
3.	Soldier A: Using hex head socket, put three jackscrews (5) in three threaded holes of upper race ring (6). Tighten jackscrews enough so fingers can get under race ring.
4.	Soldiers B and C: Lift upper race ring (6) from cupola (4).
5.	Soldier A: Using hex head socket, remove three jackscrews (5) from upper race ring.
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Do detail inspection of parts (para 12-6).
	END OF TASK



0. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE

LS: Hoist (2 ton capacity minimum)
Sling (NSN 4933-00-480-5662)
5/16" hex head socket (3/8" drive)
3/8" drive ratchet
Metal scribe
3/8" drive torque wrench (0 to 600 inch-pounds)

PLIES: Used self locking screws (from cupola bearing components removal) (six)
Self locking screw, 8728157 (thirty)
Shims, 10873683, 10883926, or 10883925 (as required)
Grease (item 12, App. A)
Rags (item 21, App. A)
Wood block, 6" X 6" X 36" (two)

RSONNEL: Three

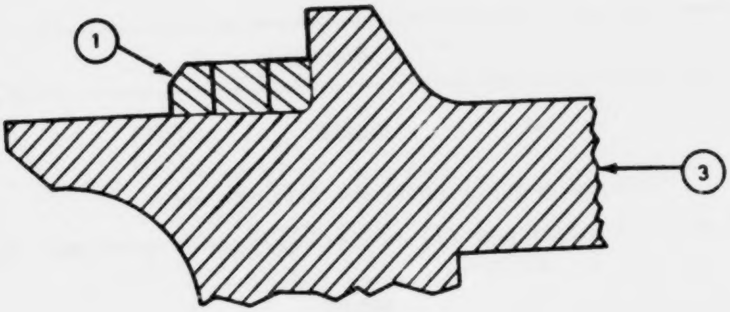
FERENCES: JPG for procedure to use torque wrench
LO 9-2350-257-12 for procedure to lubricate spur gear teeth

ELIMINARY PROCEDURES: Inspect cupola bearing components (para 12-6)

12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Soldier A: Check that upper race ring (1) is lying with large bevel up. **NOTE** Jackscrews (2) are used to help hold upper race ring (1) when putting it on cupola (3).
2.	Soldier A: Using hex head socket, put three jackscrews (2) in three threaded holes of upper race ring (1). **NOTE** Be sure that marked forward centerline screw hole of upper race ring is lined up with forward centerline screw hole of cupola.
3.	Soldiers B and C: Put upper race ring (1) on cupola (3).
4.	Soldier A: Using another jackscrew (2), start jackscrew in any attach screw hole to insure alignment between race ring (1) and cupola (3). **NOTE** Screw jackscrews out evenly so upper race ring does not bind in cupola.
5.	Soldier A: Using hex head socket, screw three jackscrews (2) out of upper race ring.
6.	Soldier A: Remove fourth jackscrew (2).
	GO TO FRAME 2


1
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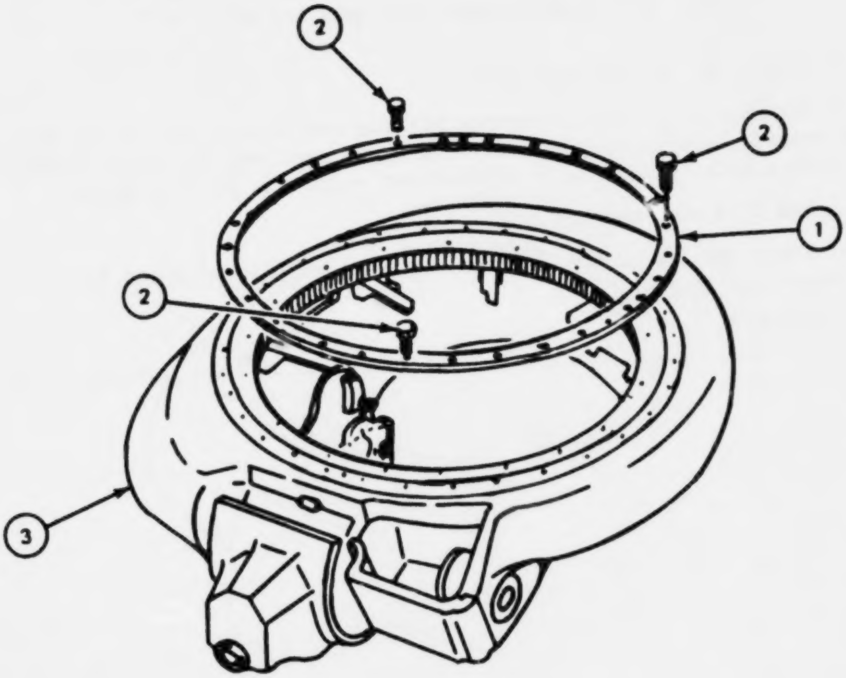
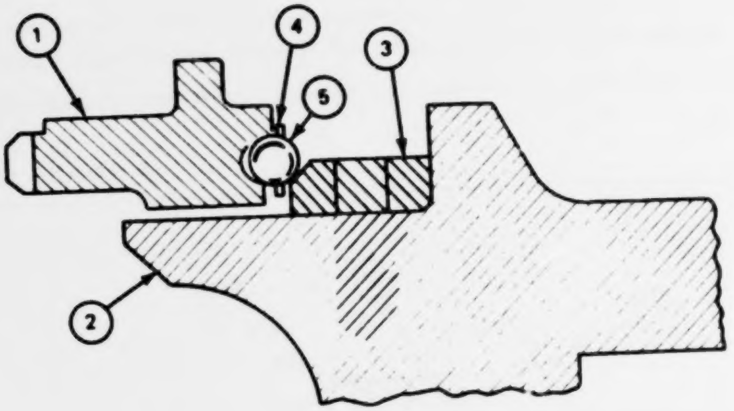
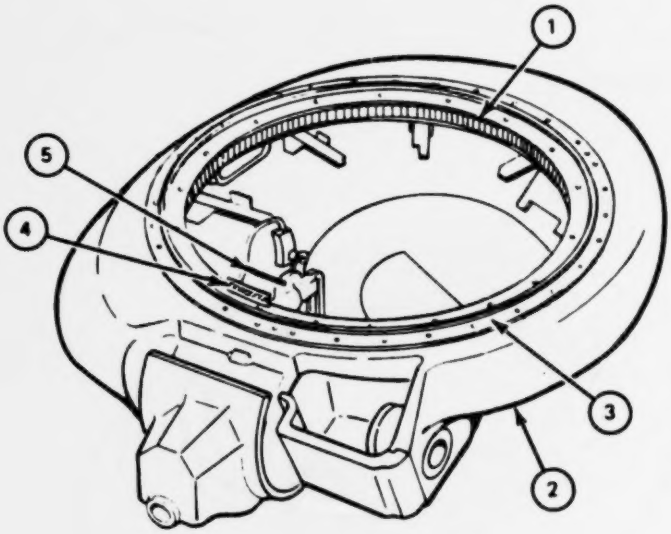


12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Spur gear is put in cupola with flat side down.
1.	Soldiers B and C: Put spur gear (1) on cupola (2) inside upper race ring (3).
	NOTE While bearing balls are being put in retainer, spur gear (1) must be held up slightly to let retainer (4) and bearing balls (5) go between spur gear and upper race ring.
2.	Soldiers B and C: Slightly lift spur gear (1).
3.	Soldier A: Starting at one end of retainer (4), put one bearing ball (5) in retainer (4), and slide retainer between spur gear (1) and upper race ring (3). Keep doing this until all 234 bearing balls (5) are put in retainer and retainer is put into place.
4.	Soldiers B and C: Lower spur gear (1).
5.	Soldier A: Check that all bearing balls (5) and retainer (4) are seated between spur gear (1) and upper race ring (3).
	GO TO FRAME 3

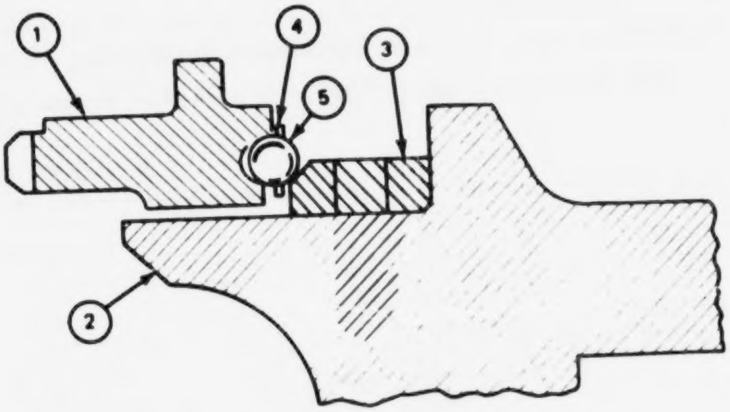


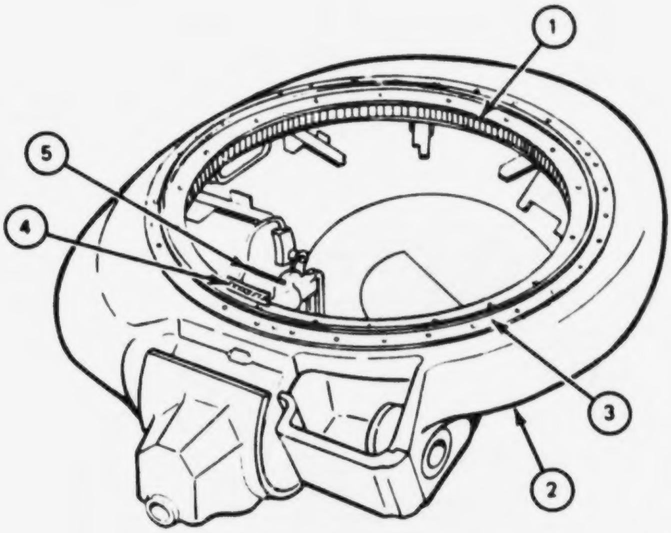


12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Spur gear is put in cupola with flat side down.
1.	Soldiers B and C: Put spur gear (1) on cupola (2) inside upper race ring (3).
	NOTE While bearing balls are being put in retainer, spur gear (1) must be held up slightly to let retainer (4) and bearing balls (5) go between spur gear and upper race ring.
2.	Soldiers B and C: Slightly lift spur gear (1).
3.	Soldier A: Starting at one end of retainer (4), put one bearing ball (5) in retainer (4), and slide retainer between spur gear (1) and upper race ring (3). Keep doing this until all 234 bearing balls (5) are put in retainer and retainer is put into place.
4.	Soldiers B and C: Lower spur gear (1).
5.	Soldier A: Check that all bearing balls (5) and retainer (4) are seated between spur gear (1) and upper race ring (3).
	GO TO FRAME 3

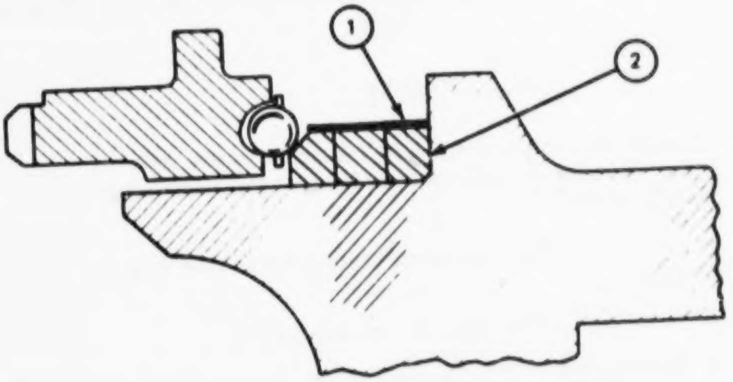


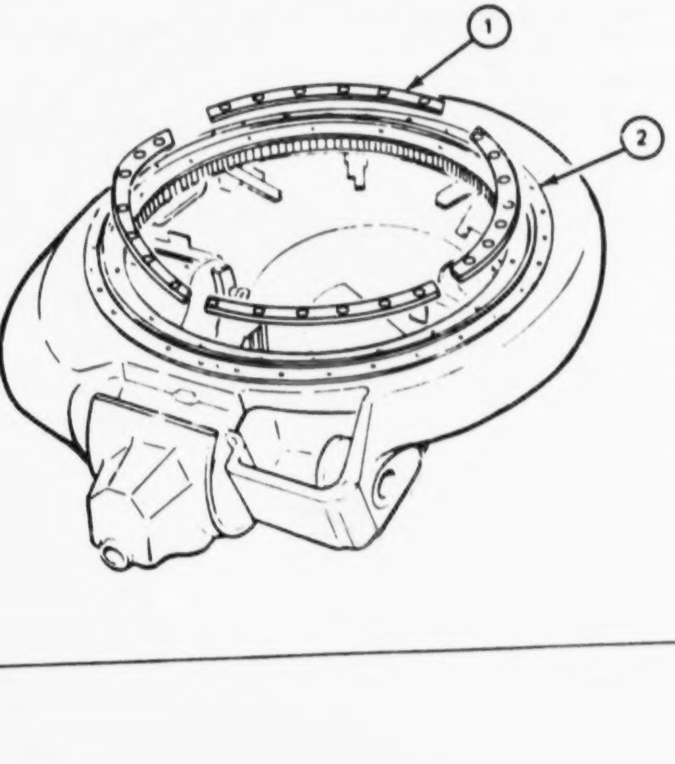


12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using notes made during removal, put shim sets (1) in place where they were removed.
2.	Carefully remove tape from shim sets (1) and line up with screw holes on upper race ring (2). GO TO FRAME 4

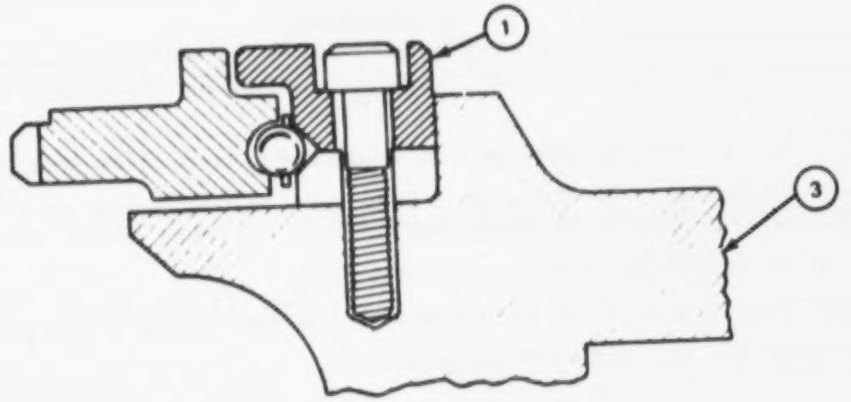


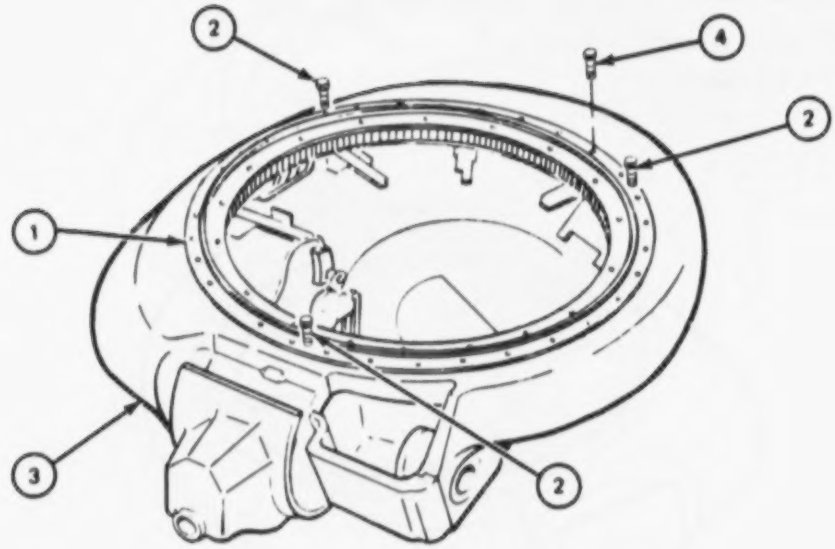


12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 4

Step	Procedure
1.	Soldier A: Check that lower race ring (1) is lying with bearing bevel down and inner lip up.
	NOTE Jackscrews (2) are used to help hold lower race ring (1) when installing it on cupola (3).
2.	Soldier A: Using hex head socket, put three jackscrews (2) in three threaded holes of lower race ring (1).
	NOTE Be sure that marked forward centerline screw hole of lower race ring is lined up with forward centerline screw hole of cupola. Do not move shim sets when putting lower race ring in cupola.
3.	Soldiers C and D: Put lower race ring (1) on cupola (3).
4.	Soldier A: Using another jackscrew (4), start screw in any attach screw hole.
5.	Soldier B: Using hex head socket, screw three jackscrews (2) out of lower race ring. Remove jackscrews.
	GO TO FRAME 5

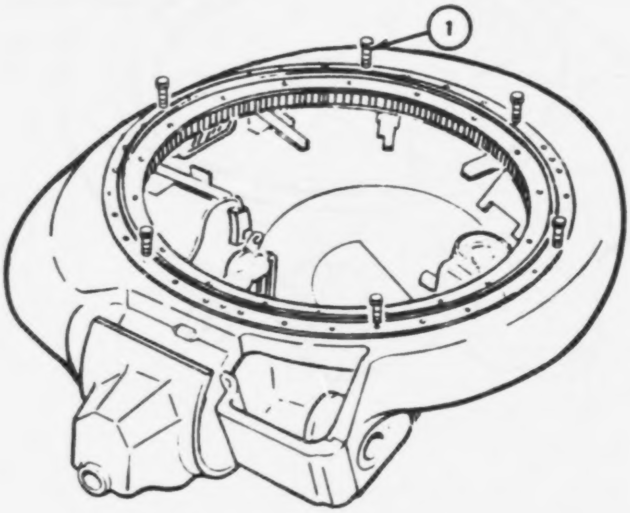

1
3



12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 5

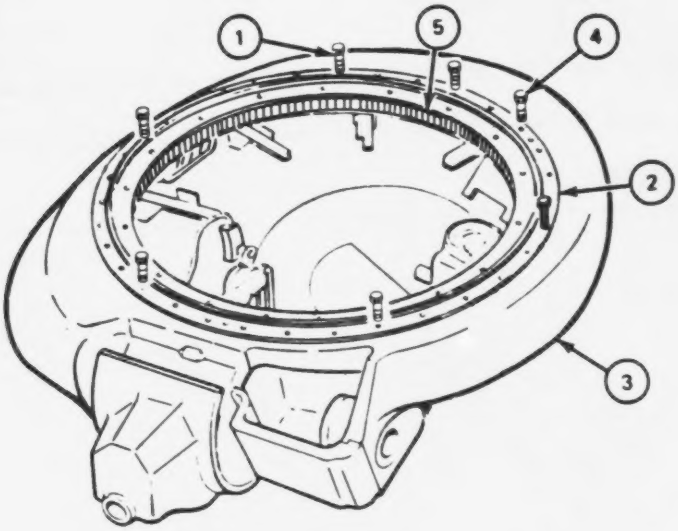
Step	Procedure
	NOTE
	Attaching screws are to be spaced evenly.
1.	Put five more jackscrews (1) in attach screw holes, spacing them in every fifth screw hole, starting with jackscrew already put in.
2.	Using hex head socket, tighten six jackscrews (1).
3.	Using torque wrench, torque six jackscrews (1) between 33 and 35 foot-pounds (JPG).
4.	Do cupola bearing components test (para 12-7).
	NOTE
	If cupola bearing components test is good, go to frame 6. If cupola bearing components test is bad, do step 5.
5.	Do cupola bearing components adjustment (para 12-8).
6.	Repeat steps 4 and 5 as necessary.
	GO TO FRAME 6



10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

AME 6

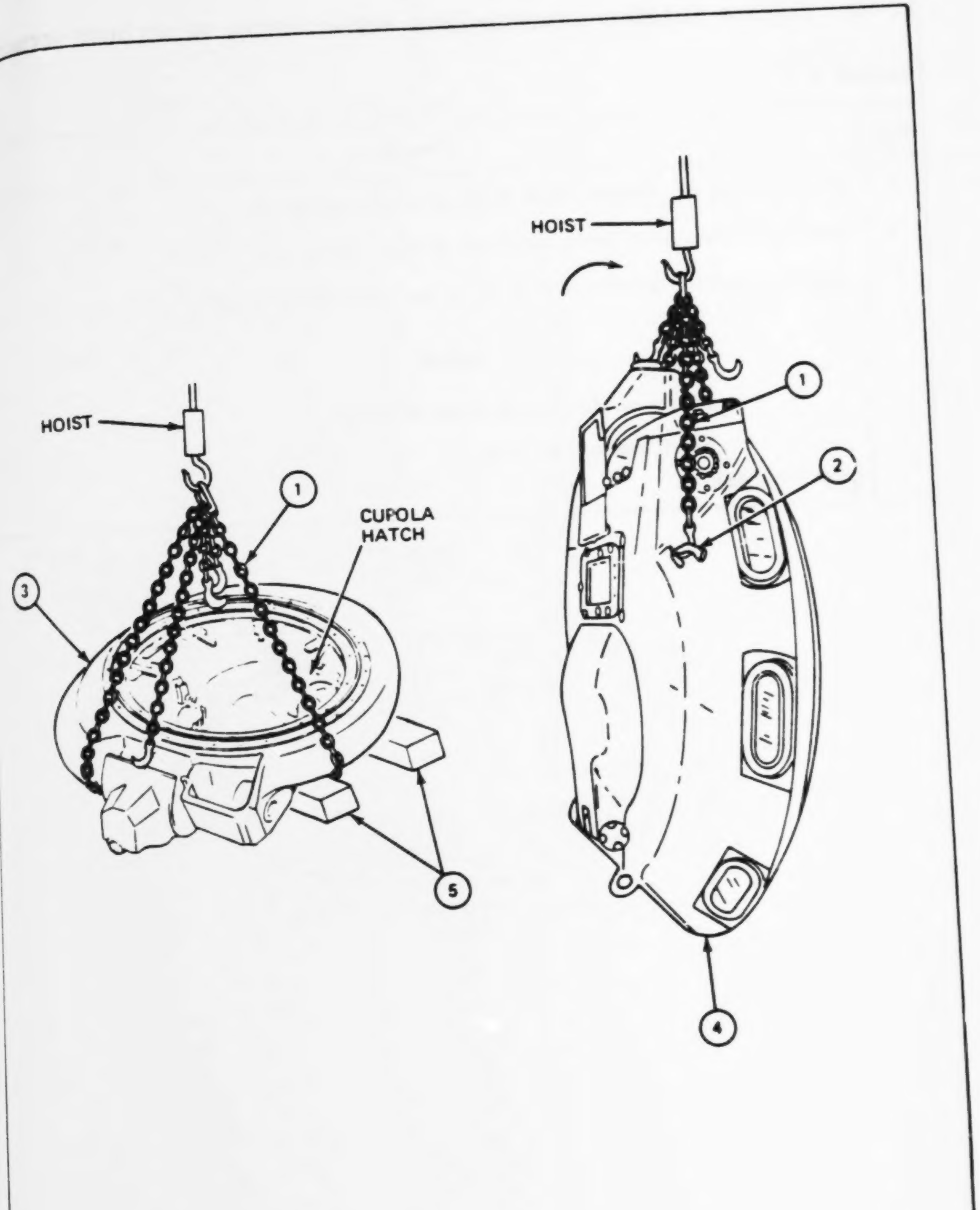
ep	Procedure
1.	Using hex head socket, remove six jackscrews (1) that attach lower race ring (2) to cupola (3).
2.	Using hex head socket, attach lower race ring (2) to cupola (3) with 30 new self-locking screws (4).
3.	Using torque wrench, torque self locking screws (4) between 33 and 35 foot-pounds (JPG).
4.	Grease teeth of spur gear (5) (LO).
	GO TO FRAME 7



12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 7

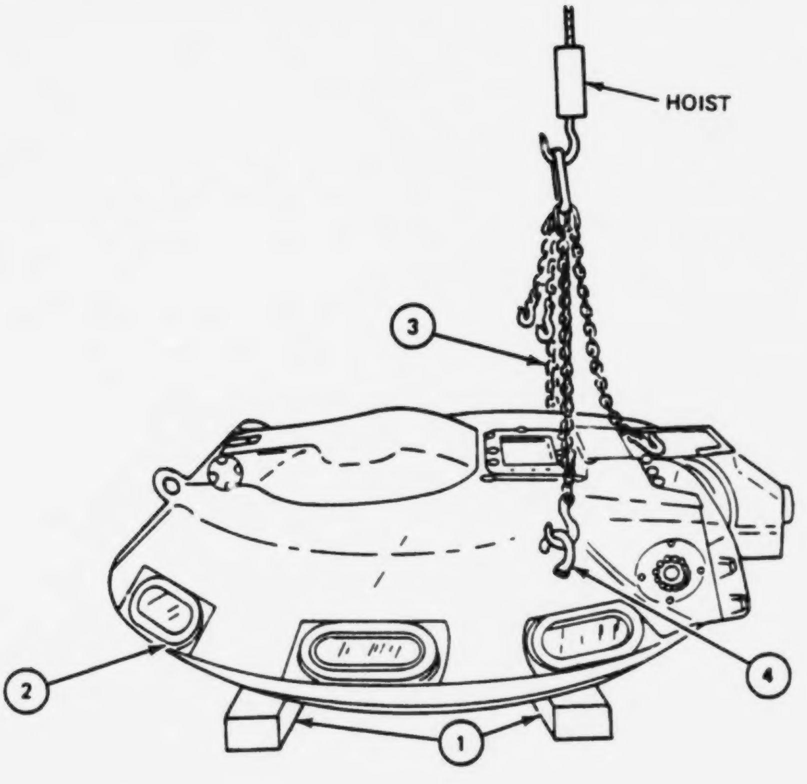
Step	Procedure
1.	Soldier A: Attach two legs of sling (1) on two front lifting eyes (2) on roof of cupola (3) and hoist.
2.	Soldier B: Check that cupola hatch is locked. **WARNING** Cupola (3) weighs one ton. Soldiers must stay clear of cupola when it is being lifted or moved by hoist, to keep from getting hurt.
3.	Soldier C: Using hoist, lift cupola (3) until edge (4) is touching floor.
4.	Soldiers A and B: Remove two wood blocks (5) from under cupola (3).
	GO TO FRAME 8


HOIST
CUPOLA HATCH
HOIST

12-10. CUPOLA BEARING COMPONENTS INSTALLATION PROCEDURE (CONT)

FRAME 8

Step	Procedure
1.	Soldiers A and B: Position wood blocks (1) under cupola (2).
2.	Soldier C: Using hoist, lower cupola (2) on wood blocks (1).
3.	Soldiers A and B: Remove sling (3) from two front lifting eyes (4).
	NOTE Follow-on Maintenance Action Required: Install cupola (para 12-4).
	END OF TASK


HOIST

Section 4. CUPOLA AZIMUTH GEAR BOX

MAINTENANCE PROCEDURES INDEX

ment Item	Adjustment	Test	Tasks Disassembly	Assembly	Repair
ola Azimuth ar Box	12-12	12-13	12-14	12-15	12-16

12-12. CUPOLA AZIMUTH GEAR BOX ADJUSTMENT PROCEDURE

TOOLS: Vise
5/64" socket head screw key (Allen wrench)
1/8" flat tip screwdriver (two)

PERSONNEL: Two

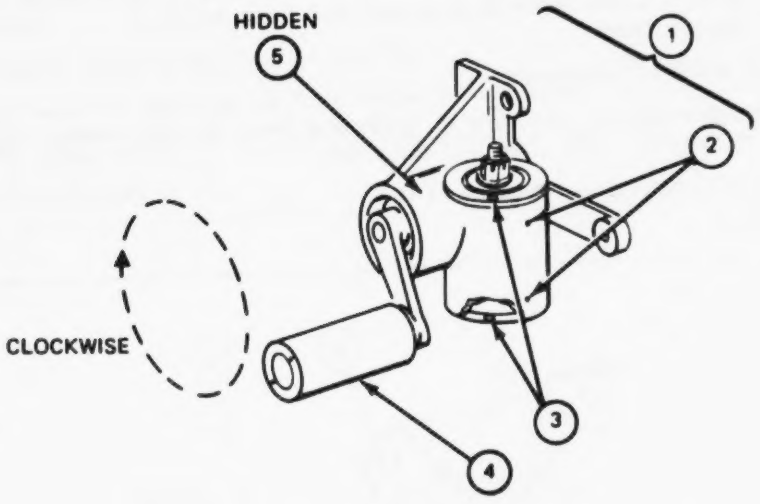
REFERENCES: TM 9-2350-257-20-2-3 for procedure to remove cupola azimuth gear box

EQUIPMENT CONDITION: Cupola azimuth gear box removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Assemble cupola azimuth gear box (para 12-15)

FRAME 1

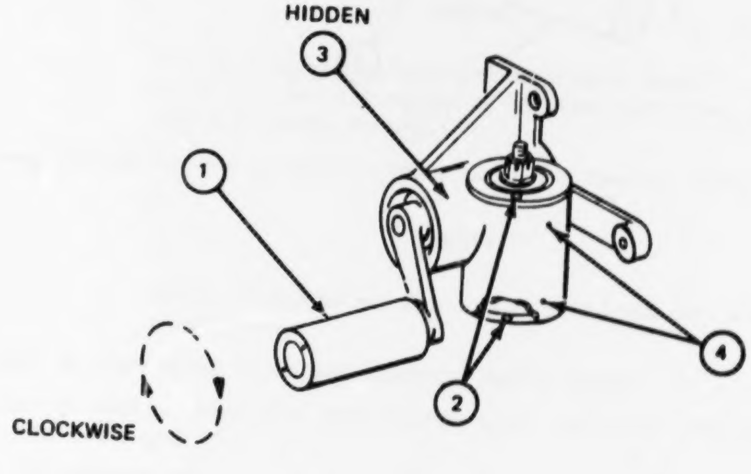
Step	Procedure
1.	Put cupola azimuth gear box (1) in vise.
2.	Using Allen wrench, loosen two setscrews (2).
	NOTE If slots in upper and lower bearing retainer rings (3) are more than five degrees out of line with each other, do step 3, otherwise do step 4.
3.	Using screwdriver, line up slots in upper and lower bearing retainer rings (3).
	NOTE Soldier A and soldier B must start and finish step 4 at the same time.
4.	Soldier A: Turn crank (4) slowly clockwise until it binds. Soldier B: Using screwdrivers, turn slots in upper and lower bearing retainer rings (3) towards worm gear (5). GO TO FRAME 2


HIDDEN
CLOCKWISE

12-12. CUPOLA AZIMUTH GEAR BOX ADJUSTMENT PROCEDURE (CONT)

FRAME 2

Step	Procedure
	NOTE Soldier A and soldier B must start and finish step 1 at the same time.
1.	Soldier A: Turn crank (1) clockwise. Soldier B: Using screwdrivers, turn slots in upper and lower bearing retainer rings (2) away from worm gear (3) until crank (1) turns free.
2.	Using Allen wrench, tighten two setscrews (4). GO TO FRAME 3



CUPOLA AZIMUTH GEAR BOX ADJUSTMENT PROCEDURE (CONT)

3

Procedure

SUPPORT SHOP WORK

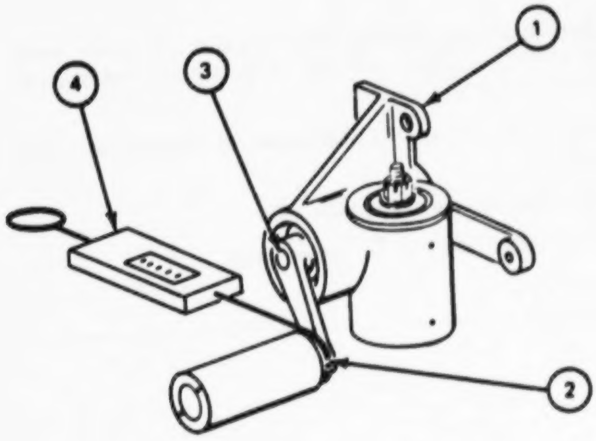
Take cupola azimuth gear box to support shop where dial indicator and spring scale are available.

Put cupola azimuth gear box (1) in vise.

Mark crank (2) three inches from center of crankshaft (3).

Attach spring scale (4) to mark done in step 3 on crank (2).

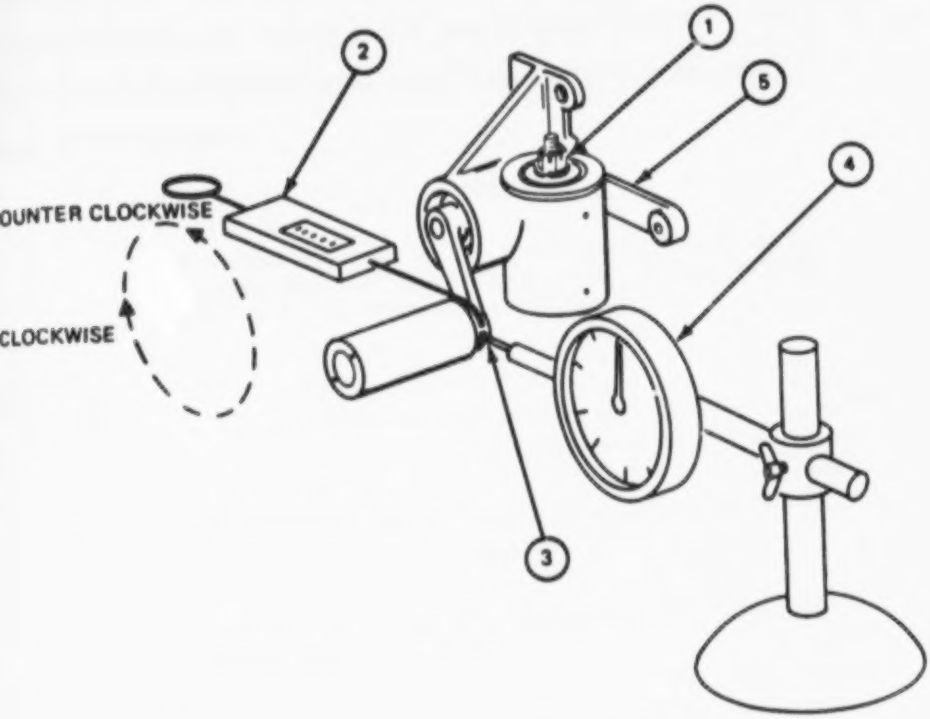
GO TO FRAME 4



12-12. CUPOLA AZIMUTH GEAR BOX ADJUSTMENT PROCEDURE (CONT)

FRAME 4

Step	Procedure
	SUPPORT SHOP WORK
	NOTE Soldier A must do step 1 for all of Frame 4.
1.	Soldier A: Using wrench, keep output gear nut (1) from turning.
	Soldier B: Pull spring scale (2) clockwise 90 degrees to crank arm (3) until it reads 6 to 6.5 pounds.
2.	Soldier A: Put zero reading dial indicator (4) against mark on crank (3) and set to zero.
	NOTE In step 3, if zero reading dial indicator (4) reads more than 0.045 inches, repeat adjustment procedure. Otherwise, do step 4.
3.	Soldier B: Pull spring scale (2) counterclockwise 90 degrees to crank arm (3) until it reads 6 to 6.5 pounds.
	Soldier A: Read zero reading dial indicator (4).
4.	Return cupola azimuth gear box (5) to turret shop.
	END OF TASK


OUNTER CLOCKWISE
CLOCKWISE

3. CUPOLA AZIMUTH GEAR BOX TEST PROCEDURE

ONNEL: One

ERENCES: TM 9-2350-257-20-2-3 for procedure to remove cupola azimuth gear box

IPMENT CONDITION: Cupola azimuth gear box removed (TM-20-2-3)

LIMINARY PROCEDURES: Adjust cupola azimuth gear box (para 12-12)

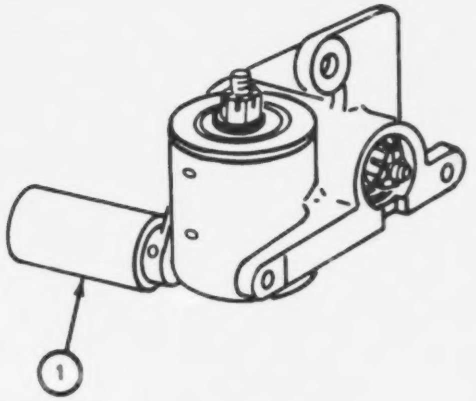
ERAL INSTRUCTIONS:

NOTE

If normal indication is not obtained, disassemble cupola azimuth gear box (para 12-14). Refer to section index (para 12-11) for replacement of parts.

AME 1

ep	Procedure
.	Check for smooth movement and no binding when turning crank (1) in both directions. **NOTE** If normal indication was obtained in step 1, cupola azimuth gear box is good.
	END OF TASK



12-14. CUPOLA AZIMUTH GEAR BOX DISASSEMBLY PROCEDURE

TOOLS: External retaining ring pliers
9/16" combination wrench
1/8" drive pin punch
3/16" drive pin punch
1/2" drift pin
20 ounce ball peen hammer
5/64" socket head screw key (Allen wrench)
Vise with jaw caps
Needle nose pliers
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

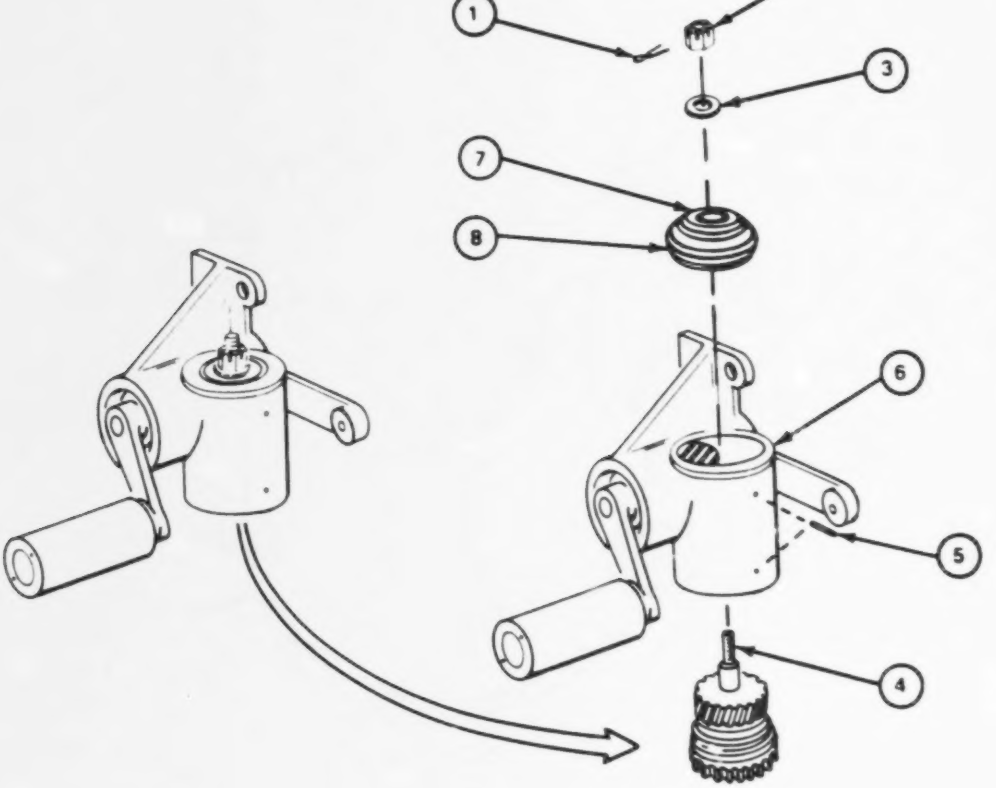
REFERENCES: JPG for procedures to:
Remove retaining rings
Remove cotter pins
Clean parts
Inspect and repair parts

PRELIMINARY PROCEDURES: Test cupola azimuth gear box (para 12-13)

4. CUPOLA AZIMUTH GEAR BOX DISASSEMBLY PROCEDURE (CONT)

ME 1

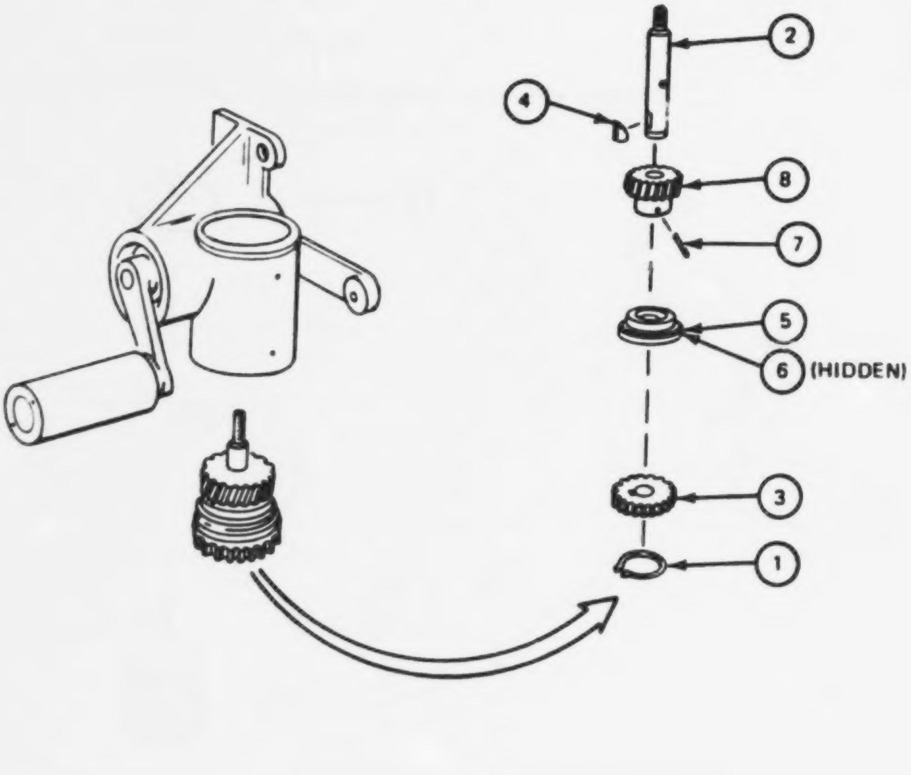
p	Procedure
	Using needle nose pliers, remove cotter pin (1) from nut (2) (JPG).
	Using combination wrench, remove nut (2) and spacer (3) from shaft (4).
	Using Allen wrench, remove two setscrews (5) from housing (6).
	Using hammer and drift pin, tap shaft (4) through bearing (7), retainer (8) and out of housing (6).
	Using hammer and drift pin, tap bearing retainer ring (8) with bearing (7) attached, from housing (6).
	GO TO FRAME 2



12-14. CUPOLA AZIMUTH GEAR BOX DISASSEMBLY PROCEDURE (CONT)

FRAME 2

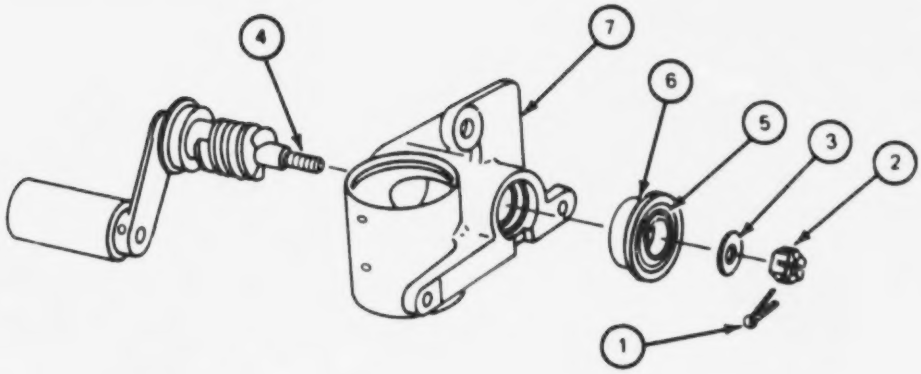
Step	Procedure
1.	Using retaining ring pliers, remove retaining ring (1) from shaft (2) (JPG).
2.	Using hammer and drift pin, tap shaft (2) from gear (3).
3.	Using hamnmer and drift pin, tap key (4) from shaft (2).
4.	Using hammer and drift pin, tap shaft (2) from bearing retainer ring (5) with bearing (6) attached.
5.	Using hammer and 3/16'' drive pin punch, tap spring pin (7) through worm gear (8) and shaft (2).
6.	Using hammer and drift pin, remove worm gear (8) from shaft (2). GO TO FRAME 3



14. CUPOLA AZIMUTH GEAR BOX DISASSEMBLY PROCEDURE (CONT)

AME 3

ep	Procedure
.	Using needle nose pliers, remove cotter pin (1) from nut (2) (JPG).
.	Using combination wrench, remove nut (2) and spacer (3) from shaft (4).
.	Using hammer and drift pin, tap shaft (4) through bearing (5), sleeve bushing (6) and out of housing (7).
4.	Using hammer and drift pin, tap sleeve bushing (6) with bearing (5) attached, from housing (7).
	GO TO FRAME 4



12-14. CUPOLA AZIMUTH GEAR BOX DISASSEMBLY PROCEDURE (CONT)

FRAME 4

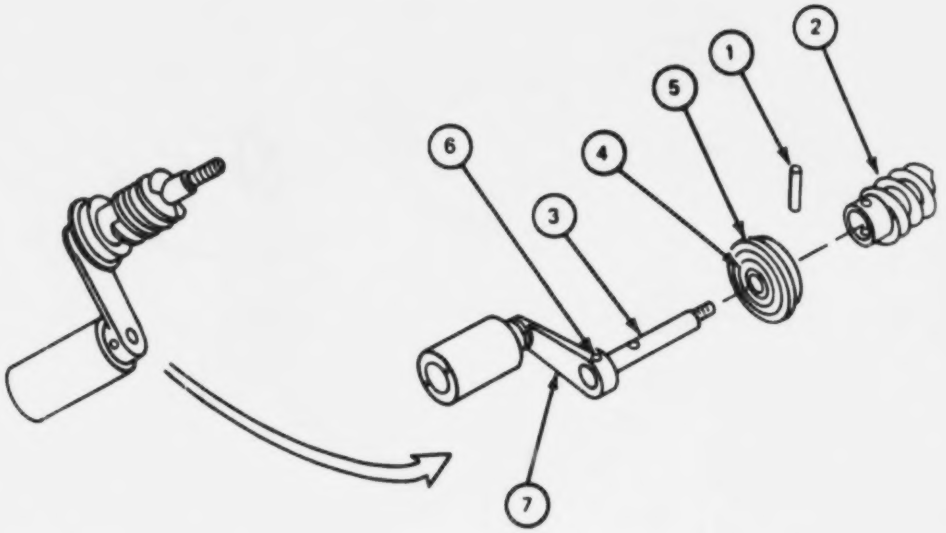
Step	Procedure
1.	Using hammer and 3/16" drive pin punch, tap spring pin (1) through worm gear (2) and shaft (3). Remove spring pin (1).
2.	Using hammer and drift pin, tap shaft (3) through worm gear (2), bearing (4) and sleeve bushing (5).
3.	Using hammer and 1/8" drive pin punch, drive spring pin (6) through crank (7) and shaft (3). Remove spring pin.
4.	Remove crank (7) from shaft (3).

NOTE

Follow-on Maintenance Action Required:

Clean all parts (JPG).
Inspect and repair all parts (JPG).
Repair cupola azimuth gear box (para 12-16).

END OF TASK



15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE

LS: 1/8 ' flat tip screwdriver
Plastic face hammer
1/2'' drift pin
External retaining ring pliers
9/16'' combination wrench
3/16'' drive pin punch
1/8'' drive pin punch
20 ounce ballpeen hammer
5/64'' socket head screw key (Allen wrench)
Needle nose pliers

PPLIES: Grease (item 12, App. A)
Cotter pin A380-2-4
Spring pin MS16562-38, MS16562-50, NAS561P6-18

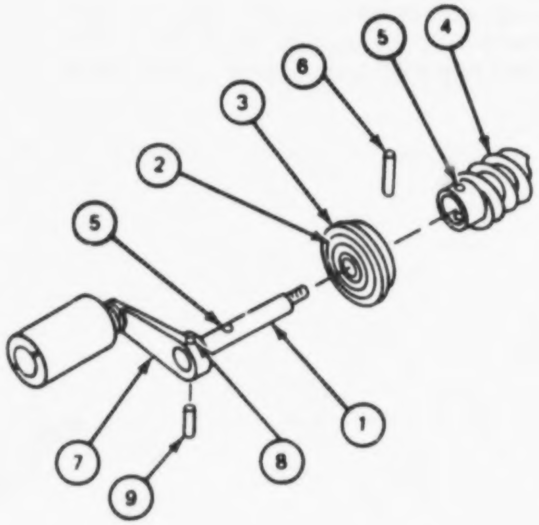
RSONNEL: One

FERENCES: JPG for procedures to:
Pack bearings with grease
Install cotter pins
Use retaining ring pliers

12-15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

FRAME 1

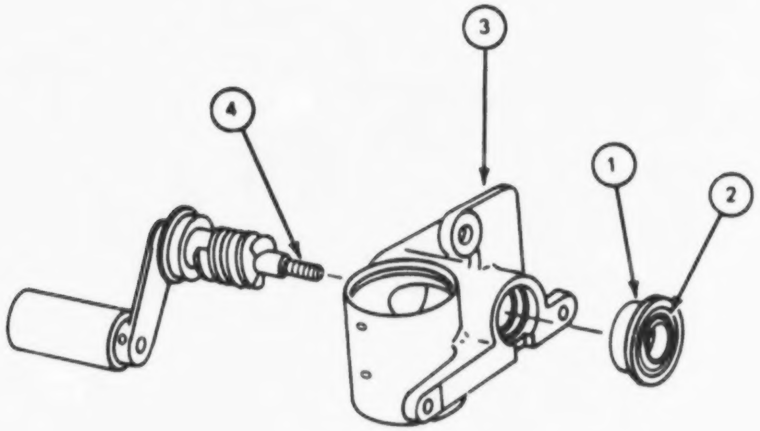
Step	Procedure
1.	Push shaft (1) through bearing (2) and sleeve bushing (3).
2.	Put worm gear (4) on shaft (1) and line up pin holes (5) with 3/16" drive pin punch.
3.	Using hammer, drive new spring pin (6) through aligned holes (5) until spring pin (6) is centered.
4.	Put crank (7) on shaft (1) and line up pin holes (8) with 1/8" drive pin punch.
5.	Using hammer, drive new spring pin (9) through aligned holes (8) until spring pin (9) is centered.
	GO TO FRAME 2



15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

AME 2

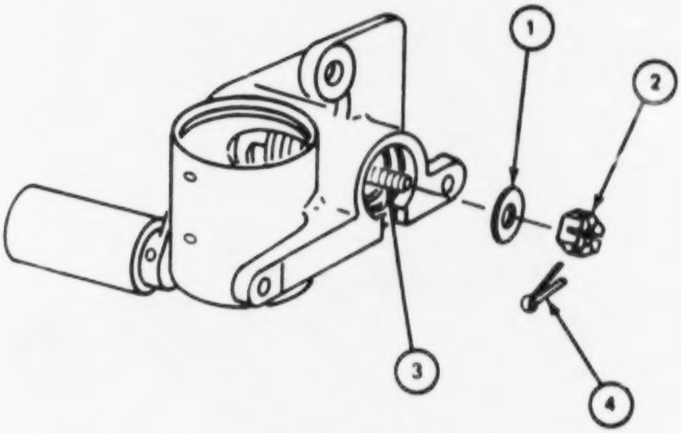
p	Procedure
	Using plastic face hammer, tap sleeve bushing (1) with bearing (2) until it seats in housing (3).
	Push shaft (4) through housing (3), sleeve bushing (1) and bearing (2).
	Using plastic face hammer, tap handle end of shaft (4) until it seats in housing (3).
	GO TO FRAME 3



12-15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Put spacer (1) and nut (2) on shaft (3).
2.	Using combination wrench, tighten nut (2).
3.	Using combination wrench, loosen nut (2) 1/4 turn and line up on nut with hole in shaft (3).
4.	Put new cotter pin (4) through slot in nut and hole in shaft (3) (JPG). GO TO FRAME 4



CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

E 4

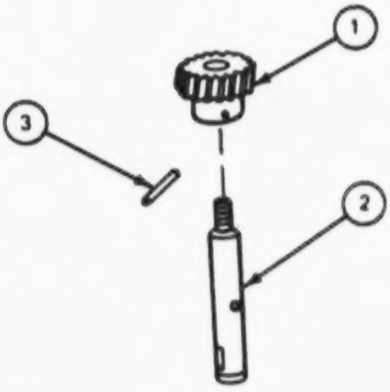
Procedure

Put worm gear (1) on shaft (2).

Using 3/16" drive pin punch, line up pin holes in worm gear (1) and shaft (2).

Using hammer and drift pin, tap new spring pin (3) through worm gear (1) and shaft (2) until spring pin is centered.

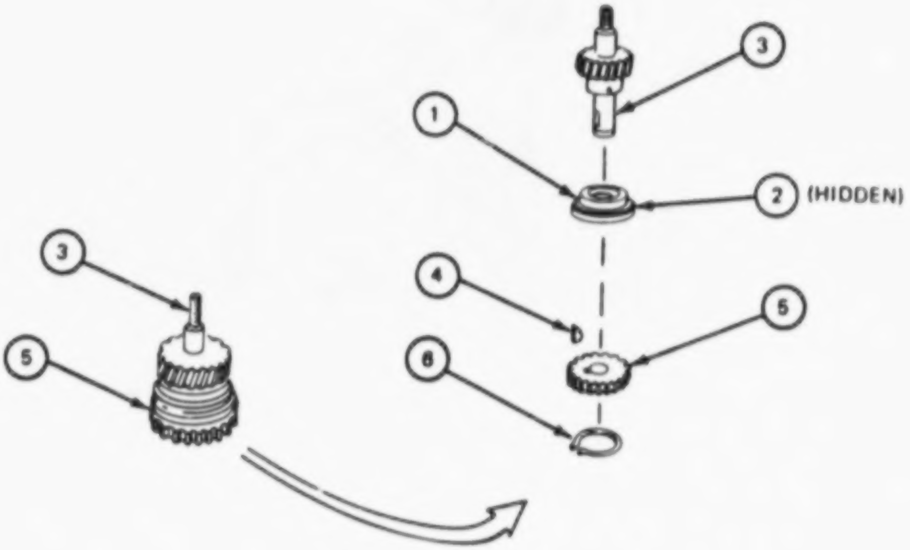
GO TO FRAME 5



12-15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

FRAME 5

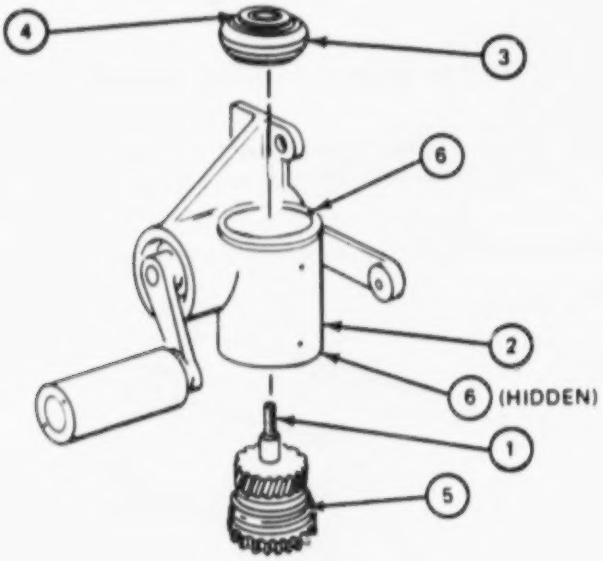
Step	Procedure
1.	Put retainer ring (1) and bearing (2) on shaft (3).
2.	Put key (4) in keyway on shaft (3).
3.	Using plastic face hammer, seat key (4) by tapping.
4.	Put gear (5) on shaft (3) and key (4).
5.	Using retaining ring pliers, put retaining ring (6) in ring groove near end of shaft (3) (JPG).
	GO TO FRAME 6



2.15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

RAME 6

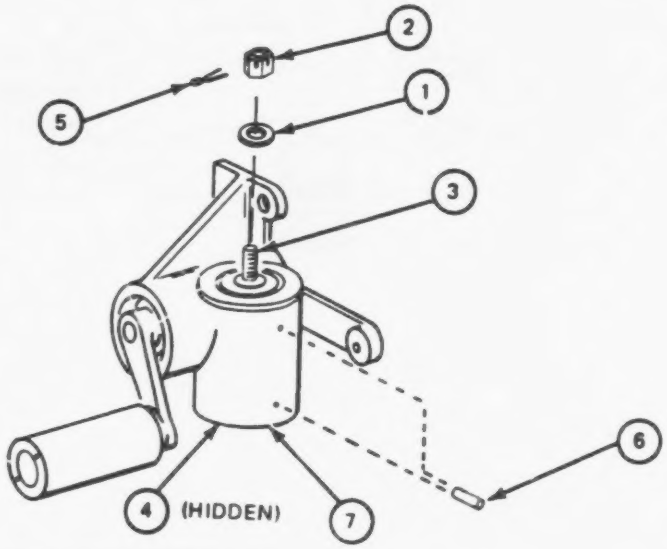
ep	Procedure
1.	Push shaft (1) into housing (2) until it seats in housing.
2.	Fill housing (2) cavity half full of grease.
3.	Push bearing retainer ring (3) and bearing (4) on shaft (1) until bearing retainer ring (3) seats in housing (2).
4.	Using screwdriver, position retainer ring (3) and retainer ring(5) slots (6) in line in vertical position.
	GO TO FRAME 7



12-15. CUPOLA AZIMUTH GEAR BOX ASSEMBLY PROCEDURE (CONT)

FRAME 7

Step	Procedure
1.	Put spacer (1) and nut (2) on shaft (3).
	CAUTION Overtightening of nut (2) will cause damge to retaining ring (4).
2.	Using wrench, tighten nut (2) until snug.
3.	Using wrench, loosen nut (2) slightly and line up slot in nut with hole in shaft (3).
4.	Using needle nose pliers, put new cotter pin (5) through slot in nut (2) and shaft (3) (JPG).
5.	Using Allen wrench, put two setscrews (6) in housing (7).
	NOTE Follow-on Maintenance Action Required: Adjust cupola azimuth gear box (para 12-12). Test cupola azimuth gear box (para 12-13).
	END OF TASK



.16. CUPOLA AZIMUTH GEAR BOX REPAIR PROCEDURE

RSONNEL: One

ELIMINARY PROCEDURES: Disassemble cupola azimuth gear box (para 12-14)

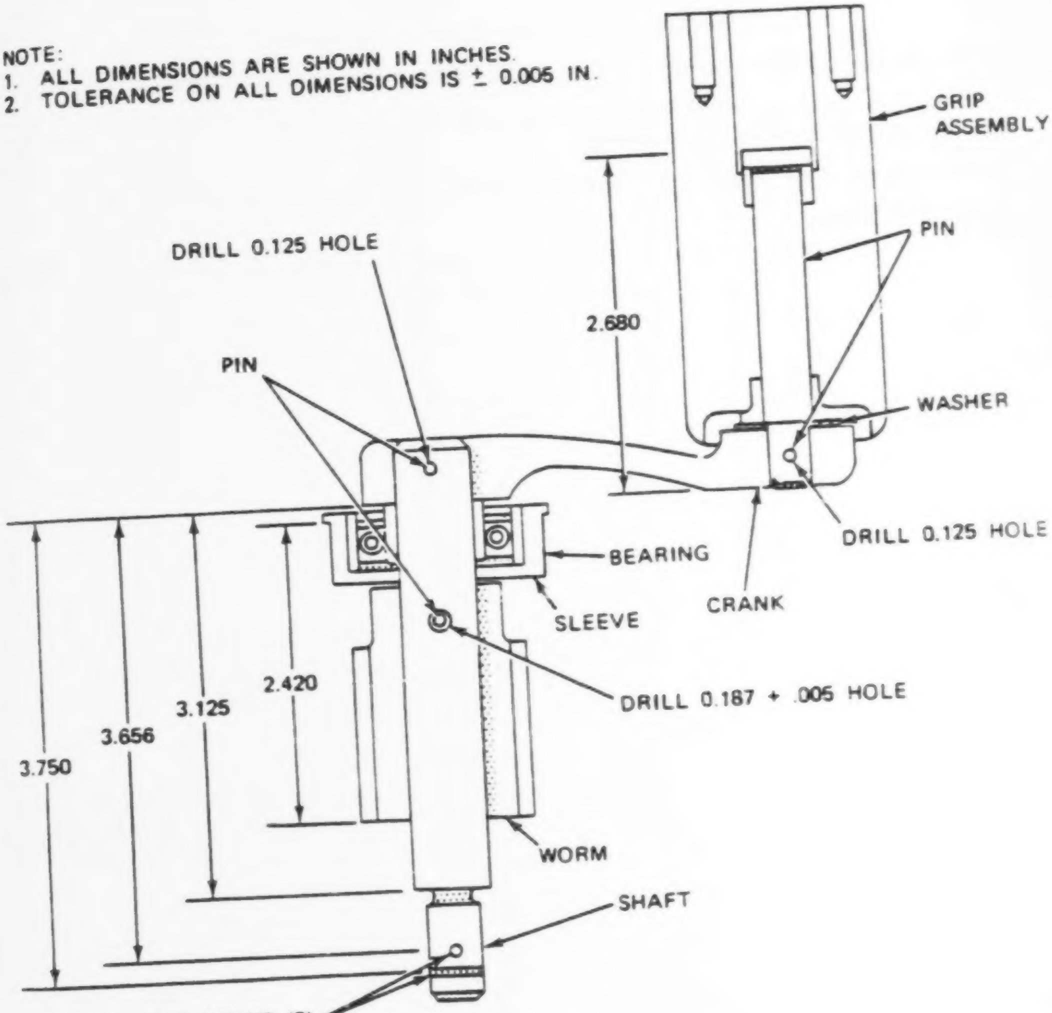
RAME 1

tep	Procedure
	SUPPORT SHOP WORK **NOTE** This frame is used to replace bad bearings.
1.	Take cupola azimuth gear box bearings to shop where press is available. a. Remove bad bearings. b. Install new bearings.
2.	After support shop work, return cupola azimuth gear box to turret shop. GO TO FRAME 2

12-16. CUPOLA AZIMUTH GEAR BOX REPAIR PROCEDURE (CONT)

FRAME 2

Step	Procedure
	SUPPORT SHOP WORK **NOTE** This frame is used to replace worm gear or shaft, and crank or shaft.
1.	Take cupola azimuth gear box parts to shop where drill press is available. a. Position parts and drill holes for new parts as required. b. Restore all threads after drilling.
2.	After support shop work, return cupola azimuth gear box parts to turret shop. GO TO FRAME 3



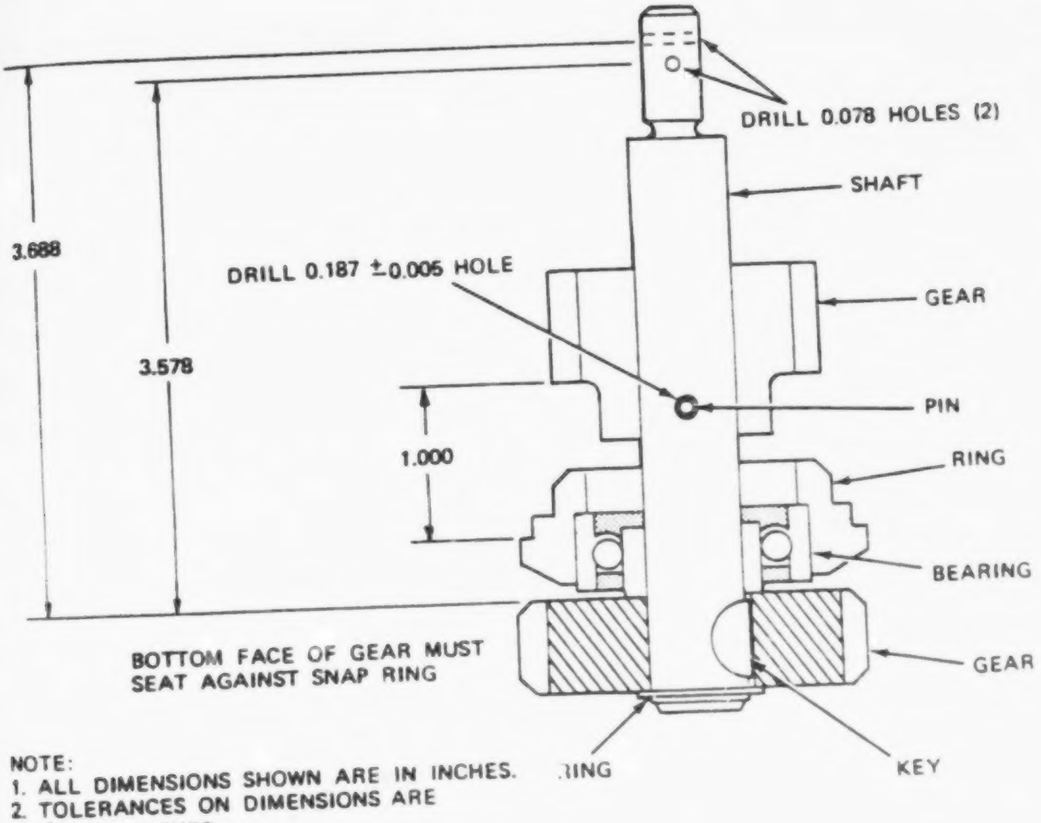
NOTE:
1. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. TOLERANCE ON ALL DIMENSIONS IS ± 0.005 IN.

GRIP ASSEMBLY
PIN
2.680
WASHER
DRILL 0.125 HOLE
PIN
DRILL 0.125 HOLE
BEARING
CRANK
SLEEVE
DRILL 0.187 + .005 HOLE
2.420
3.125
3.656
3.750
WORM
SHAFT
DRILL 0.078 HOLES (2)

12-16. CUPOLA AZIMUTH GEAR BOX REPAIR PROCEDURE (CONT)

FRAME 3

Step	Procedure
	SUPPORT SHOP WORK **NOTE** This frame is used to replace shaft with two gears.
1.	Take cupola azimuth gear box parts to shop where drill press is available. a. Position parts and drill holes for new parts as required. b. Restore all threads after drilling.
2.	After support shop work, return cupola azimuth gear box parts to turret shop. END OF TASK


DRILL 0.078 HOLES (2)
SHAFT
3.688
DRILL 0.187 ±0.005 HOLE
GEAR
3.578
PIN
1.000
RING
BEARING
GEAR
RING
KEY

BOTTOM FACE OF GEAR MUST SEAT AGAINST SNAP RING

NOTE:
1. ALL DIMENSIONS SHOWN ARE IN INCHES.
2. TOLERANCES ON DIMENSIONS ARE ±0.005 INCHES.

Section 5. ELEVATING SCREW JACK

12-17. MAINTENANCE PROCEDURES INDEX

Equipment Item	Adjustment	Test	Removal	Tasks Installation	Disassembly	Assembly	Repair
Elevating Screw Jack	12-18	12-19	12-20	12-21	12-22	12-23	12-24

3. ELEVATING SCREW JACK ADJUSTMENT PROCEDURE

EQUIPMENT: Elevating screw jack holding fixture (fabricated tool, item 9, App. B)
60-pound load

LS: Dial indicator (0.001-inch marks)
Machinist's 6-inch steel rule
3/4'' combination wrenches (two)
External retaining ring pliers

PLIES: Rope for 60-pound load
Bolts, MS 90728-118 UNC-2A (five)
Washers, MS 27183-17 (five)
Nuts, MS 21044-N8-20 UNJF-3B (five)
Bushing, NSN 3120-00-738-1345
Pencil
Masking tape (item 36, App. A)

SONNEL: One

FERENCES: JPG for procedure to use retaining pliers

ELIMINARY PROCEDURES: Remove elevating screw jack (para 12-20)

NERAL INSTRUCTIONS:

NOTE

Screw jack is adjusted in support shop by support shop and turret shop personnel.

ELEVATING SCREW JACK ADJUSTMENT PROCEDURE (CONT)

Backlash

ME 1

Procedure

SUPPORT SHOP WORK

Take holding fixture (1) and screw jack housing (2) to support shop equipped with dial indicator for measuring backlash.

Clamp holding fixture (1) to work bench.

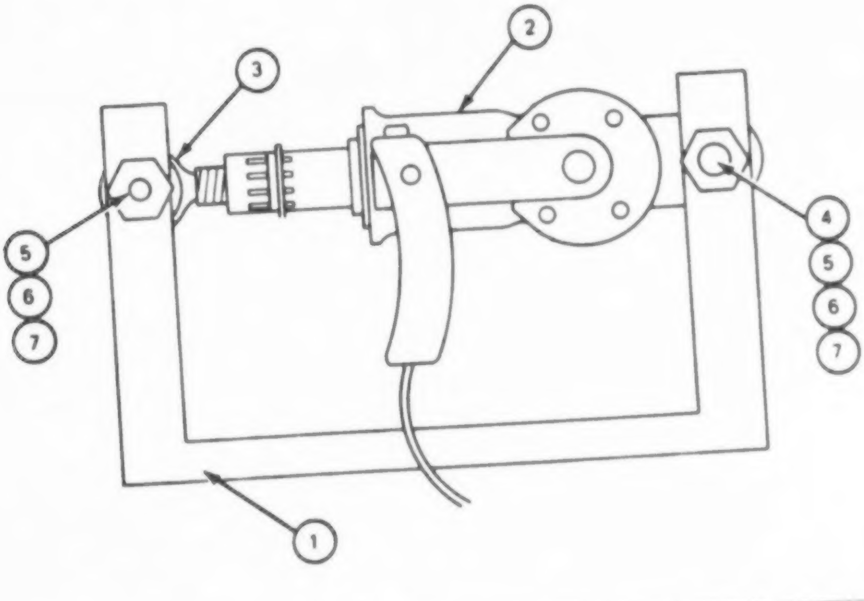
NOTE

Screw jack housing (2) and worm gear (3) must be secured in holding fixture (1) to prevent any movement at either end of screw jack.

Using combination wrenches, put in bushing (4), bolt (5), washer (6) and nut (7) that attach screw jack housing (2) to holding fixture (1).

Using combination wrenches, put in bolt (5), washer (6), and nut (7) that attach worm gear (3) to holding fixture (1).

GO TO FRAME 2

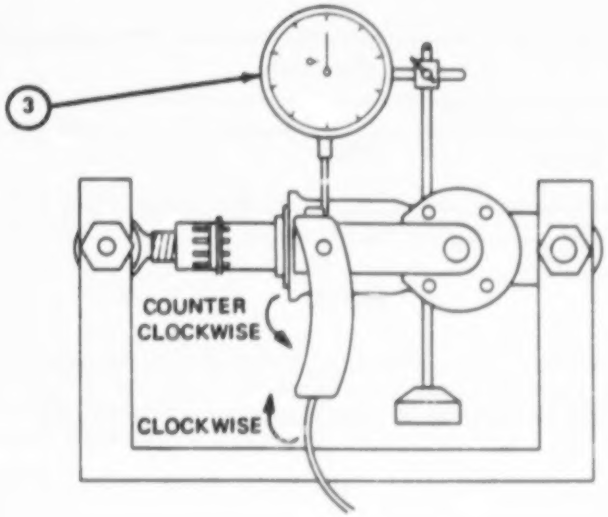


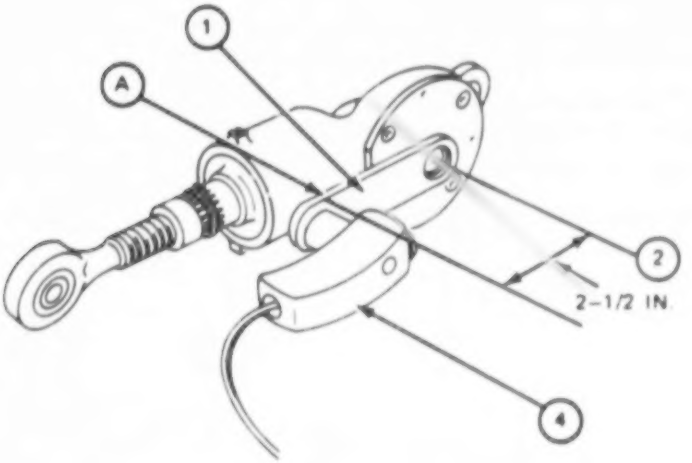
12-18. ELEVATING SCREW JACK ADJUSTMENT PROCEDURE (CONT)

a. Backlash (Cont)

FRAME 2

Step	**Procedure**
1.	Using masking tape, pencil, and rule, make reference mark (A) on crank arm (1) 2-1/2 inches from centerline of crank gearshaft (2).
2.	Move dial indicator (3) to zero. Place dial indicator (3) on crank arm (1) at reference mark (A).
3.	While watching dial indicator (3), turn screw jack handle (4) clockwise. Write down dial indicator reading.
4.	Reset dial indicator (3) to zero. While watching dial indicator (3), turn screw jack handle (4) counterclockwise. Write down dial indicator reading. **NOTE** Backlash indication must be between 0.002 and 0.009 inch.
5.	Add readings taken in steps 3 and 4. Write down number.
6.	Remove dial indicator (3) from crank arm (1).
	GO TO FRAME 3


3
COUNTER CLOCKWISE
CLOCKWISE

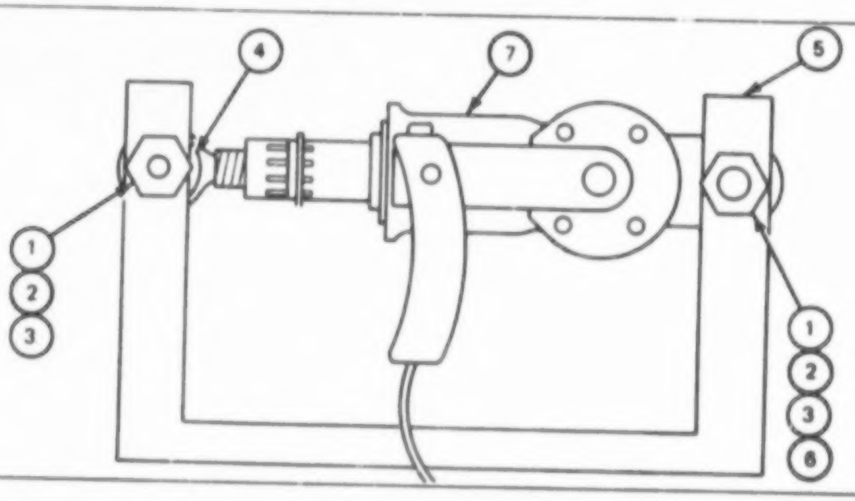

A
2-1/2 IN.

12-18. ELEVATING SCREW JACK ADJUSTMENT PROCEDURE (CONT)

a. Backlash (Cont)

FRAME 3

Step	Procedure
1.	Using combination wrenches, remove bolt (1), washer (2), and nut (3) that attach worm gear (4) to holding fixture (5).
2.	Using combination wrenches, remove bolt (1), washer (2), nut (3), and bushing (6) that attach screw jack housing (7) to holding fixture (5). Remove screw jack (7). **NOTE** If indication for backlash (step 5, frame 2) is between 0.002 and 0.009 inch, go to frame 5. If indication for backlash is not between 0.002 and 0.009 inch, go to step 3.
3.	Remove shim from screw jack housing (para 12-22, frame 1, steps 1 thru 3).
4.	Add to or take away from shim pack as follows: If indication for backlash is less than 0.002 inch, peel off layers of laminated shim and add to shim pack to get proper backlash. If indication for backlash is more than 0.009 inch, peel off layers of laminated shim pack as necessary to get proper backlash.
5.	Put shim on screw jack housing (para 12-23, frame 3, steps 4 thru 7).
6.	Adjust screw jack for proper backlash (frame 1, steps 2 thru 4; and frame 2, steps 1 thru 4). GO TO FRAME 4

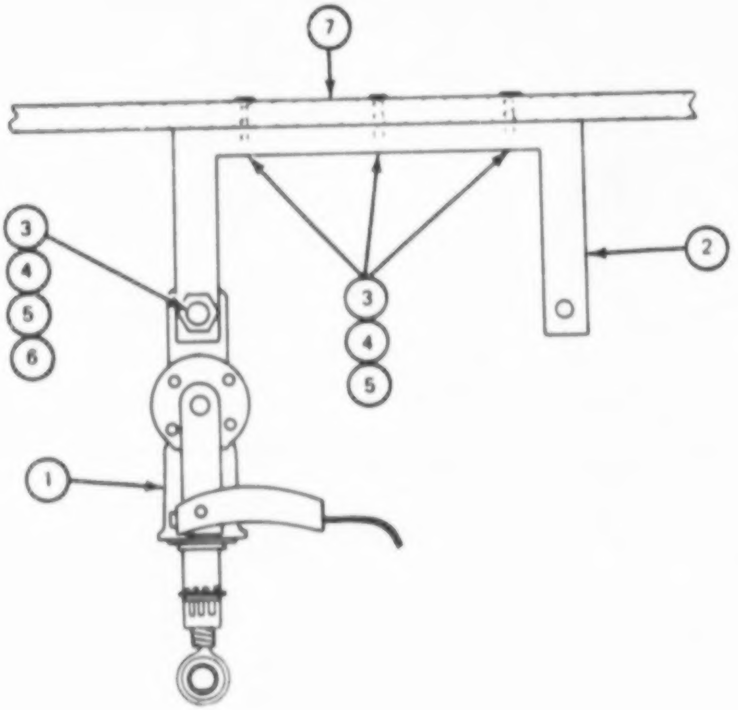


12-18. ELEVATING SCREW JACK ADJUSTMENT PROCEDURE (CONT)

b. Gear Setting

FRAME 4

Step	Procedure
	NOTE Screw jack housing (1) must be secured in holding fixture (2) to prevent any movement at housing end, and must be installed at least 5 feet above floor to allow for 60-pound load.
1.	Using combination wrenches, put a bolt (3), washer (4), and nut (5) at three places that attach holding fixture (2) to upright support (7).
2.	Using combination wrenches, put a bushing (6), bolt (3), washer (4), and nut (5) that attach screw jack housing (1) to holding fixture (2). GO TO FRAME 5

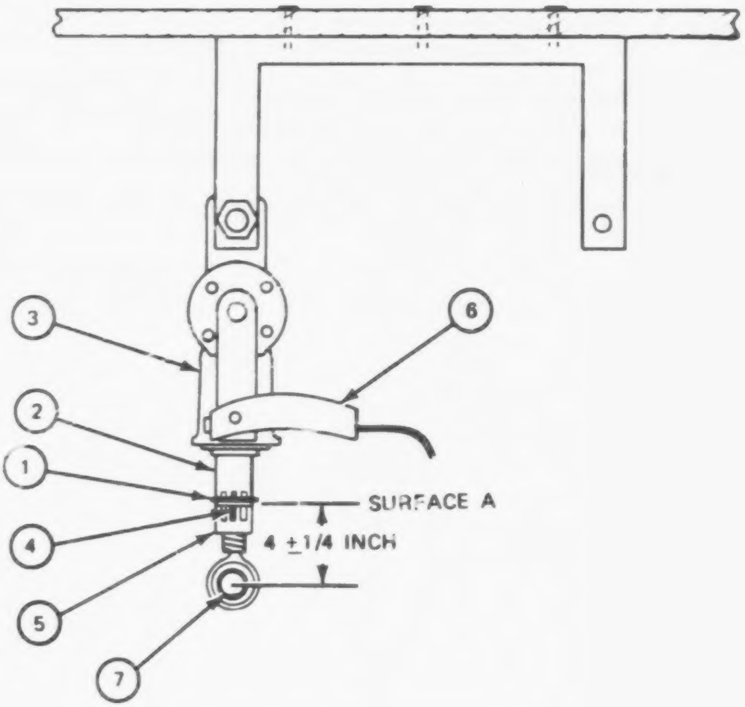


12-18. ELEVATING SCREW JACK ADJUSTMENT PROCEDURE (CONT)

b. Gear Setting (Cont)

FRAME 5

Step	Procedure
1.	Using retaining ring pliers, remove retaining ring (1) from bevel gearshaft (2) of screw jack (3).
2.	Remove machine key (4) from matching grooves of bevel gearshaft (2) and sleeve nut (5).
3.	Loosen sleeve nut (5).
4.	Turn crank handle (6) until centerline of worm gear (7) eye is between 3-3/4 and 4-1/4 inches from surface A.
	GO TO FRAME 6



2-18. ELEVATING SCREW JACK ADJUSTMENT PROCEDURE (CONT)

b. Gear Setting (Cont)

RAME 6

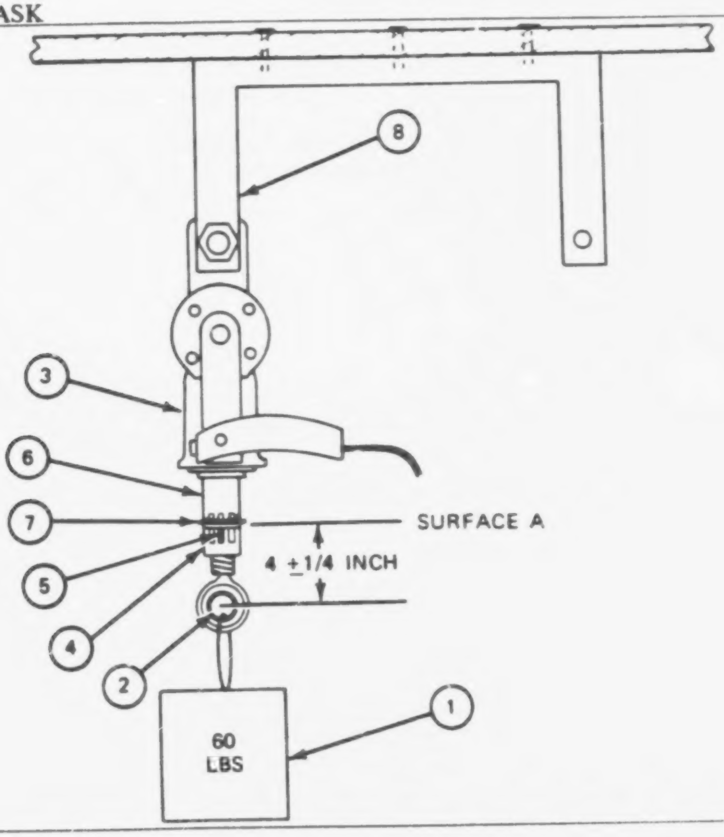
Step	Procedure
1.	Using rope, hang 60-pound load (1) from worm gear (2) eye of screw jack (3).
2.	Screw sleeve nut (4) finger-tight against surface A.
3.	Put machine key (5) in matching grooves of sleeve nut (4) and bevel gearshaft (6).
4.	Using retaining ring pliers, put retaining ring (7) in groove around bevel gearshaft (6). Do not remove 60-pound load (1) or screw jack (3) from holding fixture (8).

NOTE

Follow-on Maintenance Action Required:

Test elevating screw jack (para 12-19).

END OF TASK



12-19. ELEVATING SCREW JACK TEST PROCEDURE

TEST EQUIPMENT: Elevating screw jack holding fixture (fabricated tool, item 9, App. B)
60-pound load

TOOLS: 8" adjustable wrenches (two)
Spring scale (9 to 25-pound range)
Machinist's 6-inch steel rule

SUPPLIES: Rope for 60-pound load
Rope for spring scale
Pencil
Paper

PERSONNEL: One

PRELIMINARY PROCEDURES: Remove elevating screw jack (para 12-20)
Adjust elevating screw jack (para 12-18)

GENERAL INSTRUCTIONS:

NOTE

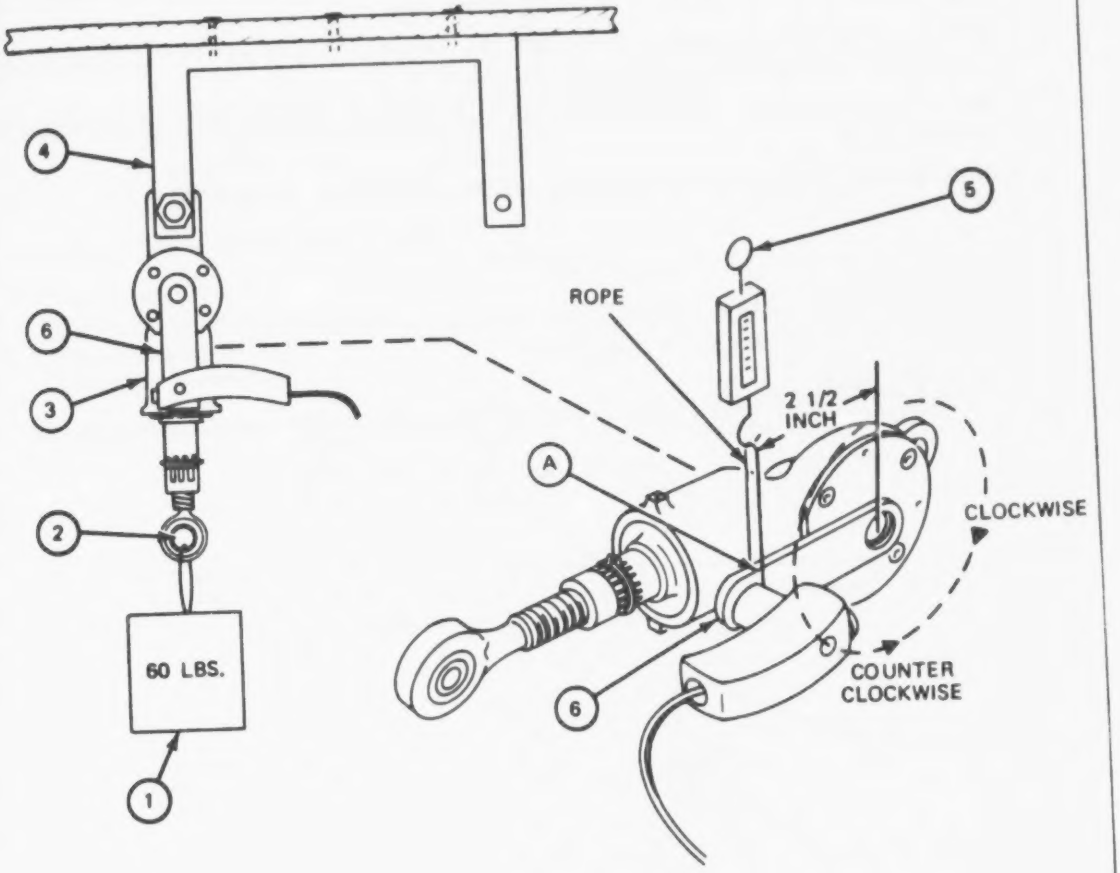
Screw jack is tested in support shop by support shop and turret shop personnel.

If normal indication is not obtained during test, readjust screw jack for proper backlash or gear setting as required (para 12-18).

12-19. ELEVATING SCREW JACK TEST PROCEDURE (CONT)

FRAME 1

Step	Procedure	Normal Indication	Probable Fault
	SUPPORT SHOP WORK **NOTE** With 60-pound load (1) connected to worm gear (2) eye, and screw jack (3) installed in holding fixture (4) (para 12-18, frames 4, 5, and 6), do following test:		
1.	Connect rope and spring scale (5) to crank arm (6) at 2-1/2 inch mark (A).	. . .	. . .
	WARNING Do not allow worm gear (2) to move more than 3-3/4 inches (gear's full working stroke is about 3-11/32 inches). The 60-pound load (1) can drop and hurt you. Spring scale (5) must be pulled at right angle to crank arm (6).		
2.	While watching spring scale (5), pull on scale so that crank arm (6) turns clockwise until worm gear (2) moves smoothly through one full working stroke. Write down indication.	a. No more than 6 pounds on spring scale (5).	a. Bad adjustment
		b. No binding.	b. Bad adjustment
3.	While watching spring scale (5), pull on scale so that crank arm (6) turns counterclockwise until worm gear (2) moves smoothly in other direction through one full working stroke. Write down indication.	a. No more than 6 pounds on spring scale (5).	a. Bad adjustment
4.	Remove rope and scale (5), and masking tape from crank arm (6).	. . .	. . .
5.	Remove 60-pound load (1) from worm gear (2) eye.	. . .	. . .
	GO TO FRAME 2		


4
6
3
2
60 LBS.
1
5
ROPE
2 1/2
INCH
A
CLOCKWISE
6
COUNTER
CLOCKWISE

12-19. ELEVATING SCREW JACK TEST PROCEDURE (CONT)

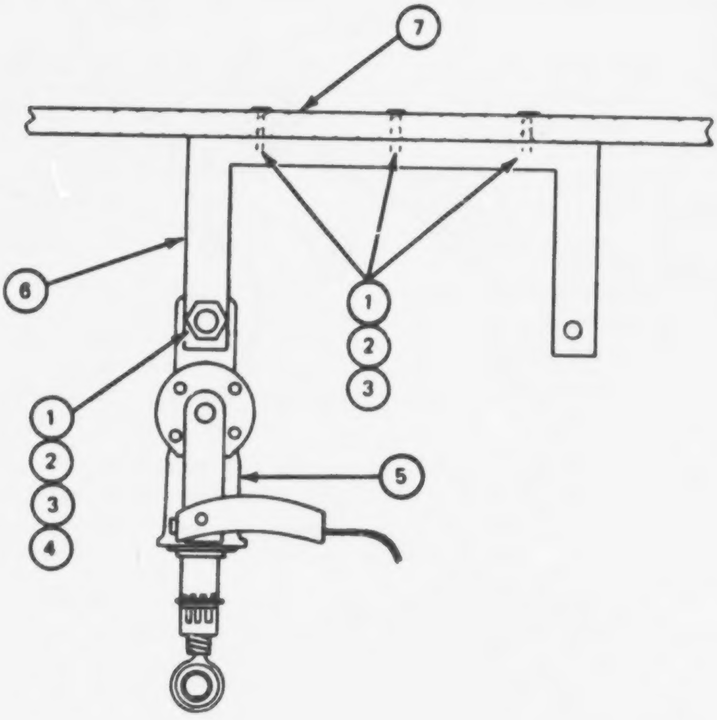
FRAME 2

Step	Procedure
1.	Using combination wrenches, remove bolt (1), nut (2), washer (3), and bushing (4) that attach screw jack (5) housing to holding fixture (6).
2.	Using combination wrenches, remove bolt (1), washer (2), and nut (3) at three places that attach holding fixture (6) to upright support (7).
3.	Return screw jack (5), holding fixture (6) and attaching hardware (1), (2), (3), and (4) to turret shop.
4.	Stow holding fixture (6), and attaching hardware (1), (2), (3), and (4).

NOTE

If normal indication was obtained in frames 1 and 2, elevating screw jack is good.

END OF TASK



12-20. ELEVATING SCREW JACK REMOVAL PROCEDURE

TOOLS: 3/8" flat tip screwdriver
3/4" socket (1/2" drive)
1/2" drive ratchet
3/4" combination wrench
7/16" combination wrench
Hammer, soft brass head

PERSONNEL: One

REFERENCES: JPG for procedure to disconnect electrical connectors
TM 9-2350-257-10 for procedures to:
  Remove caliber .50 machine gun
  Remove M36 periscope

QUIPMENT LOCATION INFORMATION:

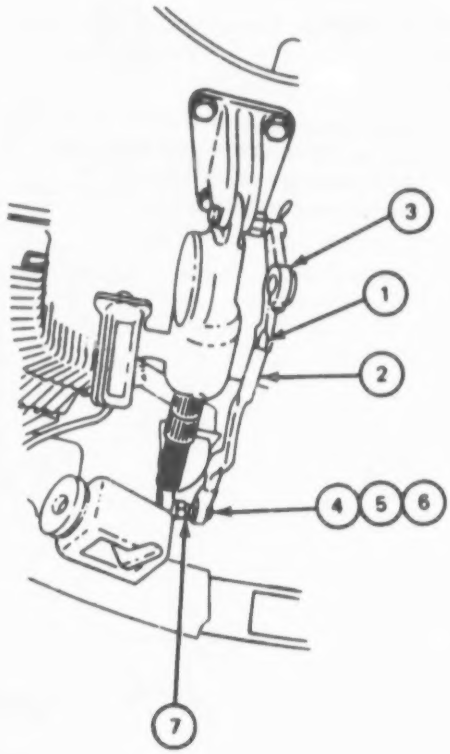
EQUIPMENT	FOLDOUT	CALLOUT
Driver's Master Control Panel	FO-4	10
Turret Traverse Lock	FO-4	6
Elevating Screw Jack	FO-2	24

QUIPMENT CONDITION: Driver's master control panel MASTER BATTERY switch set to OFF
Caliber .50 machine gun removed (TM-10)
M36 periscope removed (TM-10)
Turret traverse lock set to LOCKED

12-20. ELEVATING SCREW JACK REMOVAL PROCEDURE (CONT)

FRAME 1

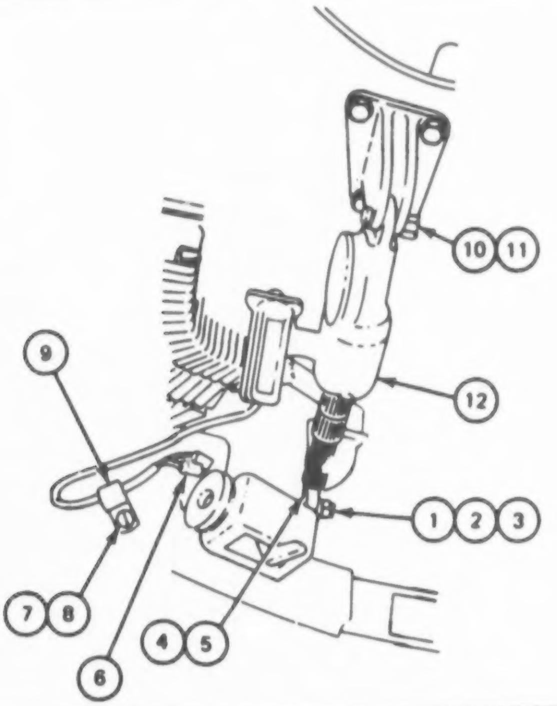
Step	Procedure
1.	Squeeze clamp (1) until periscope link assembly (2) can be removed from periscope rod (3).
2.	Using 7/16" combination wrench, remove one nut (4) and one small flat washer (5) from screw jack mounting screw (6).
3.	Remove periscope link assembly (2) and spacer (7). GO TO FRAME 2



12-20. ELEVATING SCREW JACK REMOVAL PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Using 3/4" combination wrench and socket wrench, remove nut (1), washer (2) and spring (3). **NOTE** Spring tension will cause cupola cradle to rotate upwards in step 2.
2.	Using hammer, remove screw jack mounting screw (4) and washer (5).
3.	Disconnect two electrical connectors (6) (JPG).
4.	Using screwdriver, remove screw (7), lockwasher (8), and clamp (9) that attach connectors (6) to side of cupola.
5.	Using 3/4" combination wrench and socket wrench, remove nut (10) from bolt (11).
6.	Hold elevating screw jack (12) with one hand. Remove bolt (11).
7.	Remove elevating screw jack (12).
	END OF TASK



12-21. ELEVATING SCREW JACK INSTALLATION PROCEDURE

TOOLS:
- 3/8" flat tip screwdriver
- 3/4" socket (1/2" drive)
- 1/2" drive ratchet
- 3/4" combination wrench
- 7/16" combination wrench
- 3 ounce brass hammer

SUPPLIES:
- Self-locking nut (MS 21044-N8) (two)
- Self-locking nut (MS 21083-N4)

PERSONNEL: One

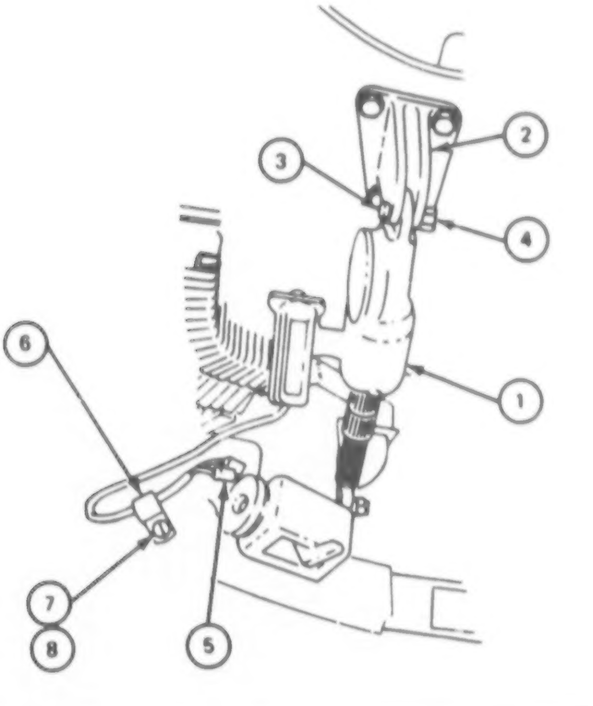
REFERENCES:
- JPG for procedure to connect electrical connectors
- TM 9-2350-257-10 for procedures to:
  - Elevate and depress caliber .50 machine gun
  - Install M36 periscope
  - Remove and install caliber .50 machine gun

EQUIPMENT CONDITION:
- Driver's master control panel MASTER BATTERY switch set to OFF
- M36 periscope removed (TM-10)
- Turret traverse lock set to LOCKED
- Caliber .50 machine gun removed (TM-10)

12-21. ELEVATING SCREW JACK INSTALLATION PROCEDURE (CONT)

FRAME 1

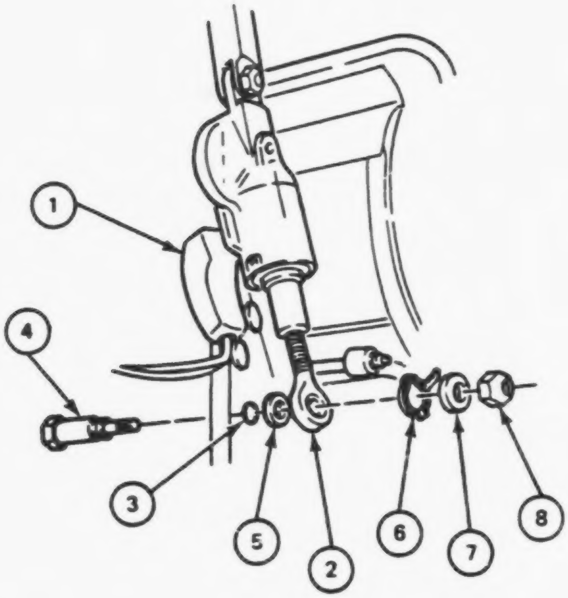
Step	Procedure
	NOTE Make sure front part of elevating screw jack (1), with smooth side toward mounting hole, is in cradle assembly before doing step 1.
1.	Place elevating screw jack (1) between mounting bracket (2). Put in screw (3).
2.	Using combination wrench and socket wrench, put new self-locking nut (4) on screw (3).
3.	Connect two electrical connectors (5) (JPG).
4.	Put clamp (6) on two electrical connector (5) leads.
5.	Using screwdriver, attach clamp (6) to cupola with lockwasher (7) and screw (8).
	GO TO FRAME 2



. ELEVATING SCREW JACK INSTALLATION PROCEDURE (CONT)

ME 2

Procedure
Rotate elevating screw jack handle (1) and line up bearing eye (2) hole with hole in cradle (3).
Put screw jack mounting screw (4) in cradle (3) far enough to put on washer (5).
Using hammer, tap screw jack mounting screw (4) through cradle assembly (3), washer (5), and bearing eye (2).
NOTE Tang on spring (6) goes in slot in bearing eye (2).
Put spring (6) and washer (7) on screw jack mounting screw (4).
Using 3/4" combination wrench and socket wrench, put new self-locking nut (8) on screw jack mounting screw (4).
GO TO FRAME 3



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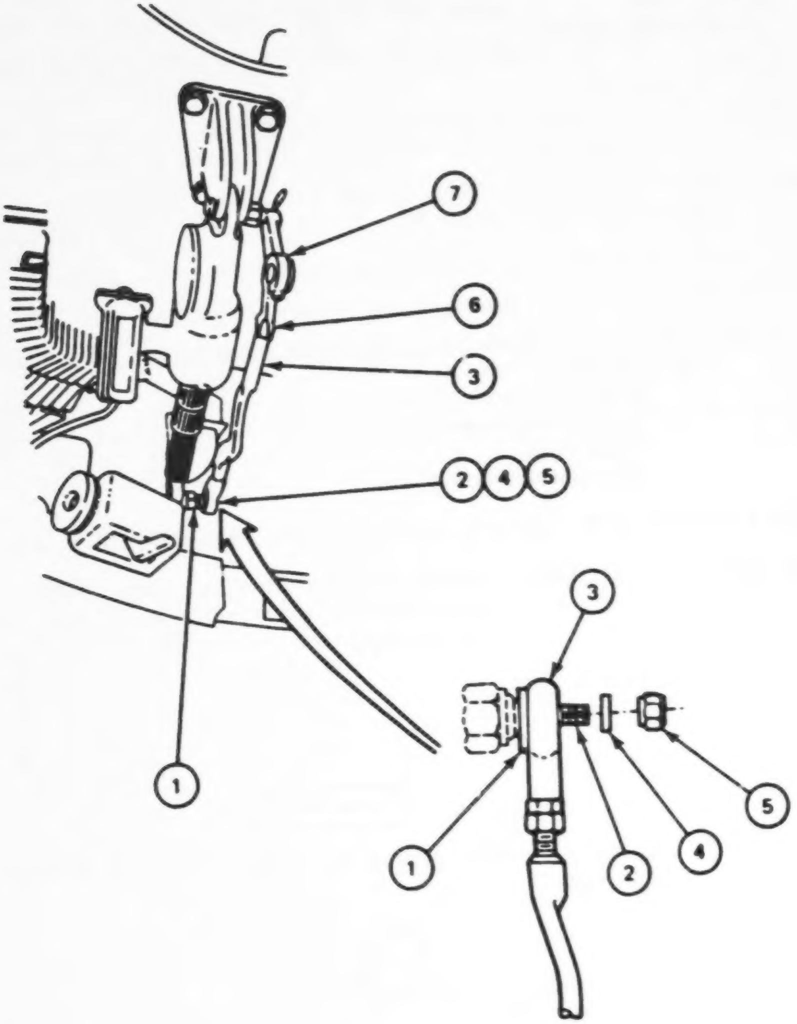
12-21. ELEVATING SCREW JACK INSTALLATION PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Put spacer (1) on screw jack mounting screw (2), flat side first.
2.	Place periscope link assembly (3) over screw jack mounting screw (2).
3.	Using 7/16" wrench, put washer (4) beveled side first, and new self-locking nut (5) on screw jack mounting screw (2).
4.	Squeeze clamp (6) together and put it over pins on periscope connecting link (7).
	NOTE Follow-on Maintenance Action Required: Install M36 periscope (TM-10). Install caliber .50 machine gun (TM-10). Elevate and depress machine gun to check elevating screw jack for proper operation (TM-10).
	END OF TASK



12-22. ELEVATING SCREW JACK DISASSEMBLY PROCEDURE

TOOLS: 20 ounce ball peen hammer
Plastic face hammer
3/32" drive pin punch
3/32" socket head screw key (Allen wrench)
5/32" socket head screw key (Allen wrench)
External retaining ring pliers
1/2" drift pin
Bearing puller
12" adjustable wrench
Scraper
Stiff bristled brush
Fine stone

SUPPLIES: Dry cleaning solvent (item 33, App. A)
Crocus cloth (item 7, App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to remove elevating screw jack handle
JPG for procedures to:
- Remove retaining rings
- Use bearing puller
- Clean parts
- Inspect and repair parts

EQUIPMENT CONDITION: Elevating screw jack handle removed (TM-20-2-3)

PRELIMINARY PROCEDURES: Remove elevating screw jack (para 12-20)
Adjust elevating screw jack (para 12-18)
Test elevating screw jack (para 12-19)

GENERAL INSTRUCTIONS:

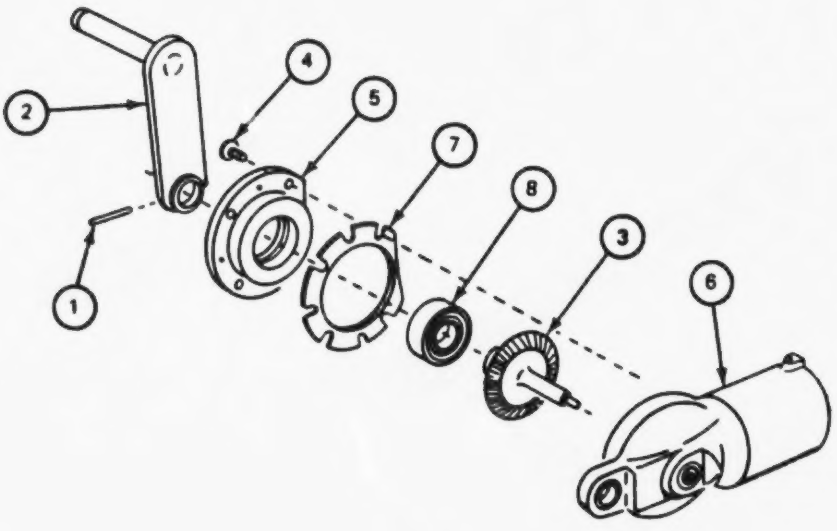
CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

2-22. ELEVATING SCREW JACK DISASSEMBLY PROCEDURE (CONT)

FRAME 1

Step	Procedure
1.	Using ball peen hammer and 3/32" drive pin punch, remove spring pin (1) that attaches hand crank (2) to crank gearshaft (3). Remove hand crank (2).
2.	Using 5/32" Allen wrench, remove four screws (4) that attach cover (5) to screw jack housing (6).
3.	Using 5/32" Allen wrench, put three screws (4) in threaded holes in cover (5), tighten evenly and remove cover (5), shims (7), bearing (8), and crank gearshaft (3) from screw jack housing (6).
4.	Remove laminated shim (7).
5.	Using ball peen hammer and drift pin, tap gearshaft (3) and bearing (8) from cover (5).
6.	Using bearing puller, pull bearing (8) from crank gearshaft (3) (JPG).
7.	Using 5/32" Allen wrench, remove three screws (4) from cover (5).
	GO TO FRAME 2



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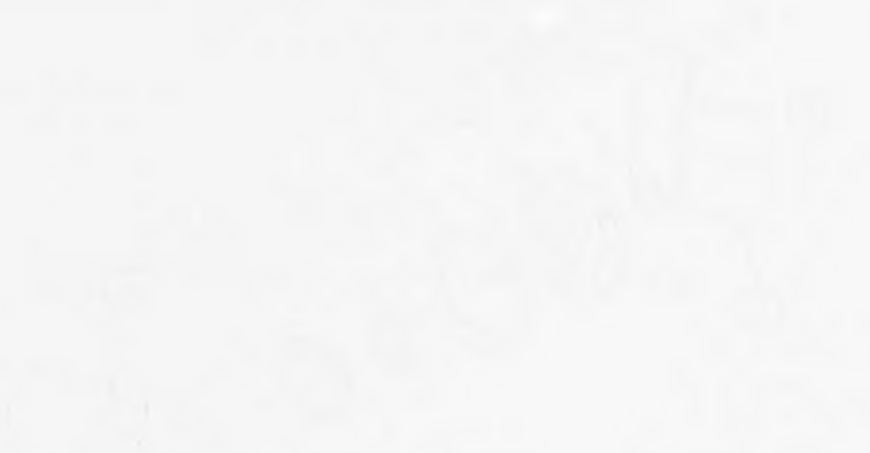

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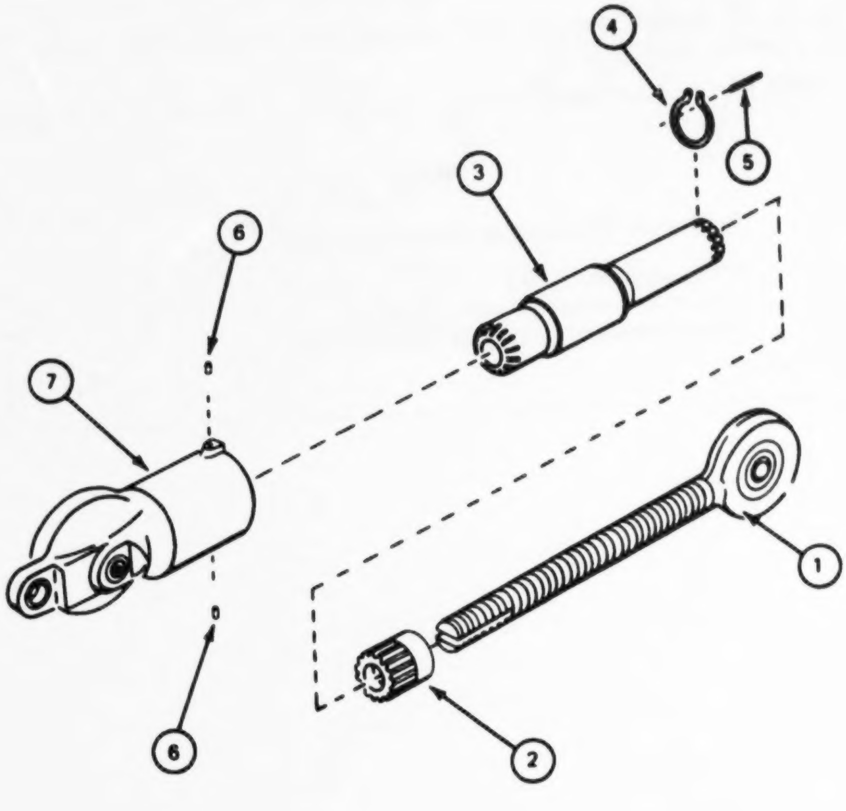
2-22. ELEVATING SCREW JACK DISASSEMBLY PROCEDURE (CONT)

FRAME 2

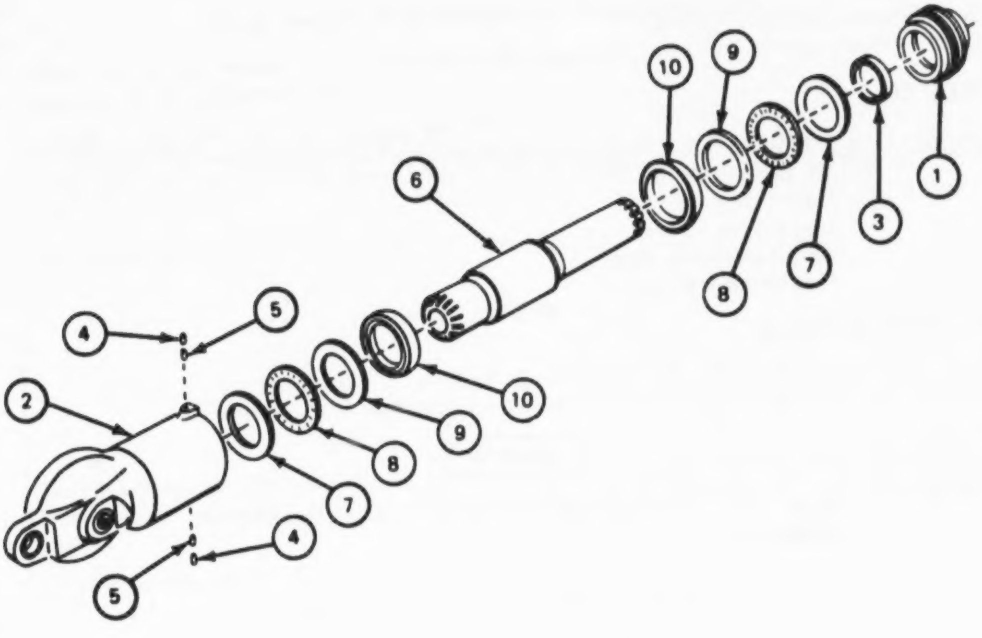
Step	Procedure
1.	Turn worm gear (1) until it is fully removed from sleeve nut (2) and bevel gearshaft (3).
2.	Using retaining ring pliers, remove retaining ring (4) that secures machine key (5) in grooves of bevel gearshaft (3) and sleeve nut (2). Remove machine key and sleeve nut (JPG).
3.	Using 3/32" Allen wrench, loosen setscrews (6) at top and bottom of screw jack housing (7).
	GO TO FRAME 3



12-22. ELEVATING SCREW JACK DISASSEMBLY PROCEDURE (CONT)

FRAME 3

Step	Procedure
1.	Using adjustable wrench, remove packing nut (1) from screw jack housing (2).
	NOTE Remove grease seal (3) only if it is being replaced.
2.	Remove grease seal (3) from packing nut (1).
3.	Using 3/32" Allen wrench, tighten two setscrews (4) into screw jack housing (2) and push out two nylon plugs (5).
4.	Remove two setscrews (4) from screw jack housing (2).
5.	Remove bevel gearshaft (6) from screw jack housing (2).
6.	Slide two thrust washers (7), two outer bearings (8), and two thrust washers (9) off ends of bevel gearshaft (6).
7.	Using plastic face hammer, tap two inner bearings (10) off ends of bevel gearshaft (6).
	NOTE Follow-on Maintenance Action Required: Clean all parts (JPG). Inspect and repair all parts (JPG). Repair elevating screw jack (para 12-24).
	END OF TASK



12-23. ELEVATING SCREW JACK ASSEMBLY PROCEDURE

TOOLS: Bearing press
20 ounce ball peen hammer
Plastic face hammer
15" adjustable wrench
3/8" drive torque wrench (0 to 150 inch-pounds)
1-1/2" crowsfoot adapter (3/8" drive)
3/32" socket head screw key (Allen wrench)
5/32" socket head screw key (Allen wrench)
Retaining ring pliers
1/2" drift pin
6" machinist's steel rule
3/32" hex head socket (3/8" drive)

SUPPLIES: Grease (item 12, App. A)

PERSONNEL: One

REFERENCES: TM 9-2350-257-20-2-3 for procedure to install elevating screw jack handle
JPG for procedures to:
Lubricate parts
Use torque wrench
Install retaining rings
Use bearing press

GENERAL INSTRUCTIONS:

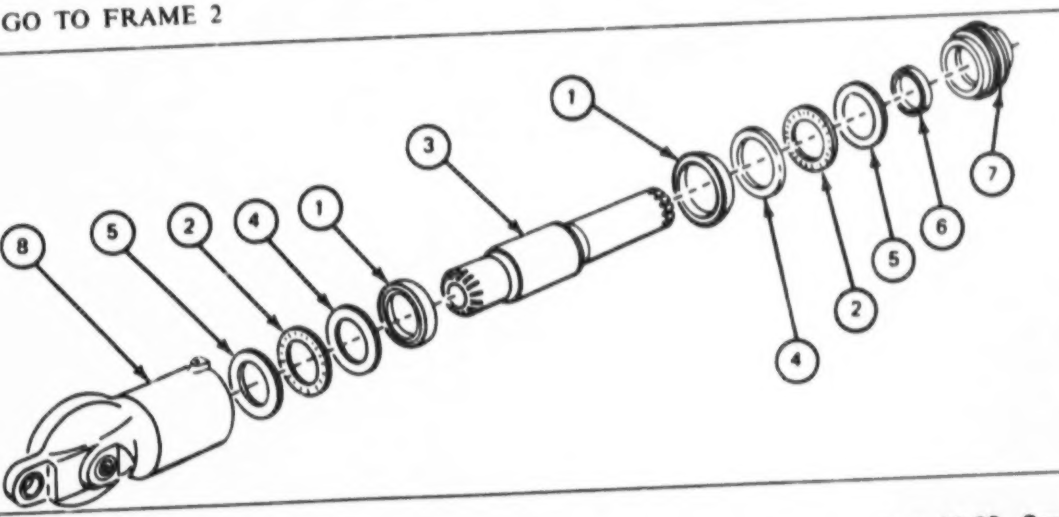
CAUTION

Keep dirt from getting in parts. Dirt can damage equipment.

23. ELEVATING SCREW JACK ASSEMBLY PROCEDURE (CONT)

AME 1

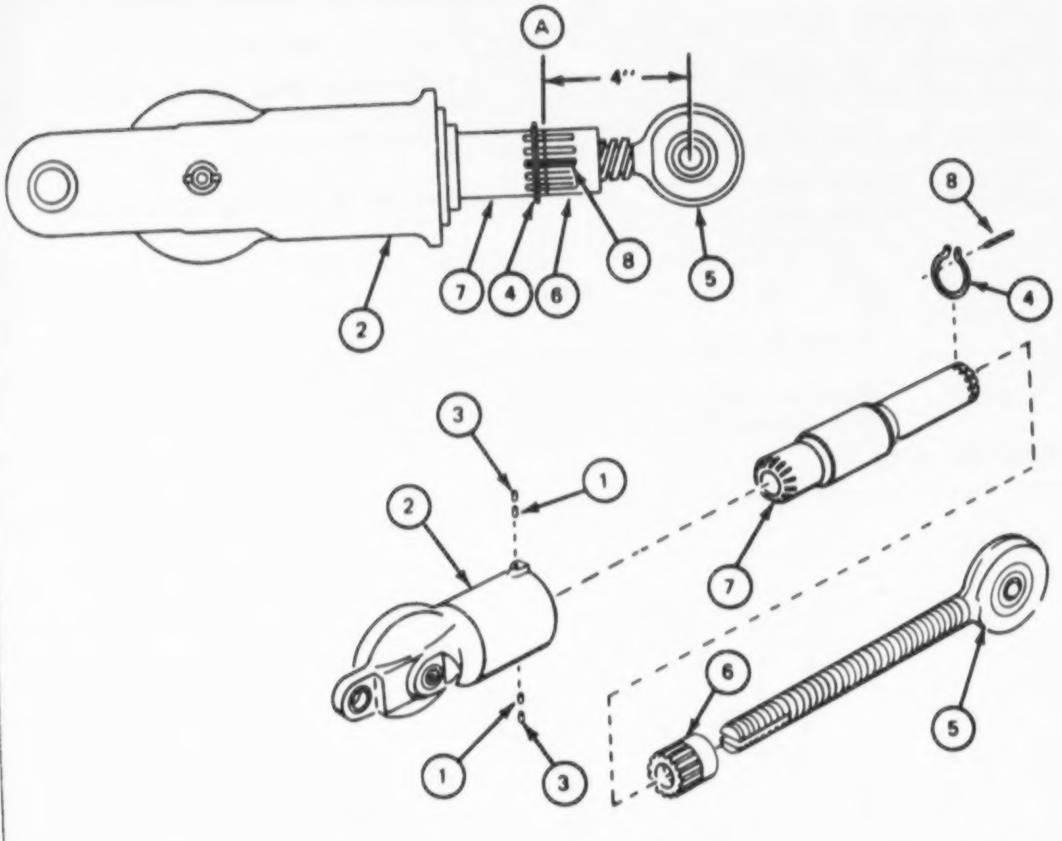
ep	Procedure
1.	Grease two inner bearings (1) and two outer bearings (2) (JPG).
2.	Place two inner bearings (1) over end of bevel gearshaft (3). Using plastic face hammer, tap bearing against each shoulder on gearshaft.
	NOTE Thrust washer (4) is thicker than thrust washer (5).
3.	Slide two thrust washers (4), two outer bearings (2), and two thrust washers (5) over ends of bevel gearshaft (3).
4.	Install grease seal (6) in packing nut (7).
5.	Slide packing nut (7) over long end of bevel gearshaft (3), being careful not to damage grease seal (6).
6.	Put bevel gearshaft (3) in screw jack housing (8).
	NOTE To make sure of a solid seating through bearings (1) and (2), it is necessary to tighten and loosen packing nut (7).
7.	Using adjustable wrench, tighten packing nut (7); loosen packing nut. Using torque wrench and crowsfoot adapter, torque packing nut to between 15 and 25 inch-pounds (JPG).
	GO TO FRAME 2



12-23. ELEVATING SCREW JACK ASSEMBLY PROCEDURE (CONT)

FRAME 2

Step	Procedure
1.	Put two nylon plugs (1) in screw jack housing (2).
2.	Using 3/32" Allen wrench, put two setscrews (3) in screw jack housing (2). Using torque wrench and hex head socket, torque two setscrews to between 10 and 14 inch-pounds (JPG).
3.	Slide retaining ring (4) over worm gear (5) and screw sleeve nut (6) on worm gear (5).
4.	Screw worm gear (5) into bevel gearshaft (7).
	NOTE Worm gear (5) should be turned so that centerline of worm gear eye is about 4 inches from surface A. It will be necessary to check this setting again during adjustment procedure (para 12-18).
5.	Turn sleeve nut (6) until groove on sleeve nut matches groove on bevel gearshaft (7) and is finger-tight.
6.	Put machine key (8) in matching grooves on sleeve nut (6) and bevel gearshaft (7). Line up notch in machine key (8) with notch in spline of bevel gearshaft (7).
7.	Using retaining ring pliers, seat retaining ring (4) in groove on bevel gearshaft (7) and groove of machine key (8) (JPG).
	GO TO FRAME 3


A
4''

12-23. ELEVATING SCREW JACK ASSEMBLY PROCEDURE (CONT)

FRAME 3

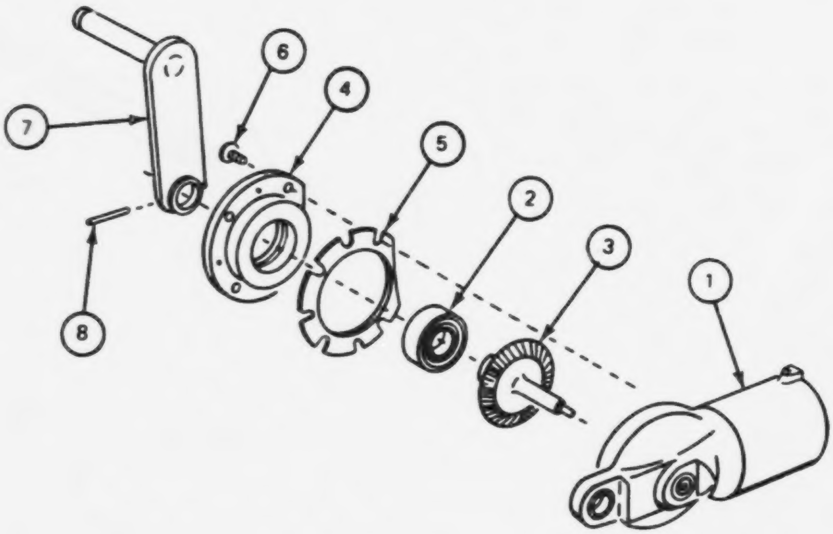
Step	Procedure
1.	Pack screw jack gear housing (1) half full with grease (JPG).
2.	Using bearing press, put bearing (2) on gearshaft (3) (JPG).
3.	Using plastic face hammer, put bearing (2) and gearshaft (3) in cover (4).
4.	Place laminated shims (5) on cover (4). Put cover on screw jack gear housing (1).
5.	Using 5/32" Allen wrench, put in four screws (6) that attach shims (5) and cover (4) to screw jack gear housing (1).
6.	Line up holes and hand crank (7) on gearshaft (3).
7.	Using ball peen hammer and drift pin, tap spring pin (8) in matching holes of hand crank (7) and gearshaft (3).

NOTE

Follow-on Maintenance Action Required:

Install elevating screw jack handle (TM-20-2-3).
Adjust elevating screw jack (para 12-18).

END OF TASK



12-24. ELEVATING SCREW JACK REPAIR PROCEDURE

SUPPLIES: Self-aligning bearing
Sleeve bearing, NSN 3120-00-516-0503
Grease (item 12, App. A)

PERSONNEL: One

PRELIMINARY PROCEDURES: Disassemble elevating screw jack (para 12-22)

GENERAL INSTRUCTIONS:

NOTE

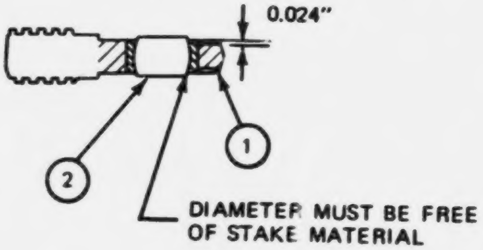
This procedure is used to replace self-aligning bearing in the worm gear and sleeve bearings in screw jack housing.

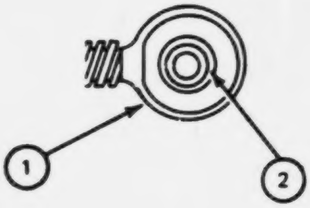
12-24. ELEVATING SCREW JACK REPAIR PROCEDURE (CONT)

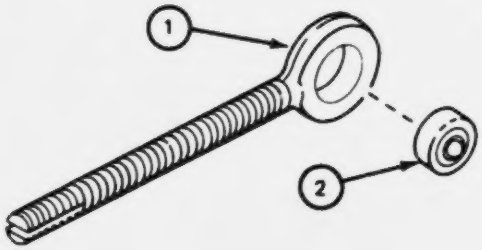
a. Self-aligning Bearing

FRAME 1

Step	Procedure
	SUPPORT SHOP WORK
1.	Take worm gear (1) with self-aligning bearing (2) to support shop equipped with bearing press and measuring tools.
2.	Remove self-aligning bearing (2) from worm gear (1) eye. Throw bearing away.
3.	Grease new self-aligning bearing (2) (JPG).
	NOTE Make sure self-aligning bearing (2) does not stick out more than 0.024 inch on either side of worm gear (1) eye.
4.	Put self-aligning bearing (2) in worm gear (1) eye.
5.	Stake worm gear (1) eye 0.06 by 0.06 inch in four places on both sides (JPG).
6.	After support shop work, return parts to turret shop.
	GO TO FRAME 2







12-24. ELEVATING SCREW JACK PROCEDURE (CONT)

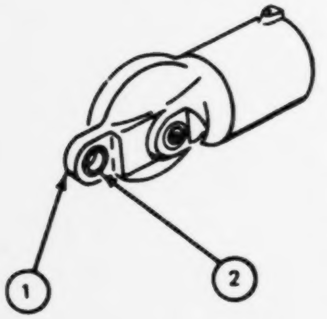
b. Sleeve Bearing

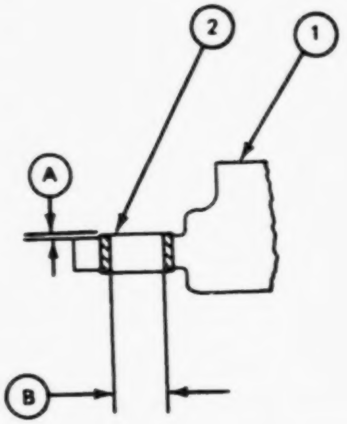
FRAME 2

Step	Procedure
	SUPPORT SHOP WORK
1.	Take screw jack housing (1) with sleeve bearing (2) to support shop equipped with bearing press, measuring and machining tools.
2.	Remove sleeve bearing (2) from screw jack housing (1). Throw bearing away.
3.	Put new sleeve bearing (2) in screw jack housing (1).
4.	Machine bearing (2) if necessary to get following dimensions:

Reference Letter	Measurement
A	0.02'' to 0.04'' both sides
B	0.751'' to 0.752''

Step	Procedure
5.	After support shop work, return parts to turret shop.
	END OF TASK





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DEPARTMENT OF THE ARMY
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Direct Support and General Support
Maintenance Manual
Part 3 Maintenance

TURRET FOR TANK, COMBAT, FULL-TRACKED:
105-MM GUN, M60A1 (RISE)
(2350-00-116-9765)
AND
M60A1 (RISE PASSIVE)
(2350-01-059-1503)

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4. The nomenclature for grenade launcher is changed to grenade discharger throughout this manual.

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11-173 through 11-176	11-173 and 11-176
11-187 and 11-188	11-187/(11-188 blank)
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Part 3 Maintenance

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Remove Pages	Insert Pages
A and B	None
i and ii	i and ii
11-105 through 11-110	11-105 through 11-110
11-169 through 11-172	11-169 through 11-172
11-245 and 11-246	11-245 and 11-246
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11-257 through 11-260	11-257 through 11-260

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Arm
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

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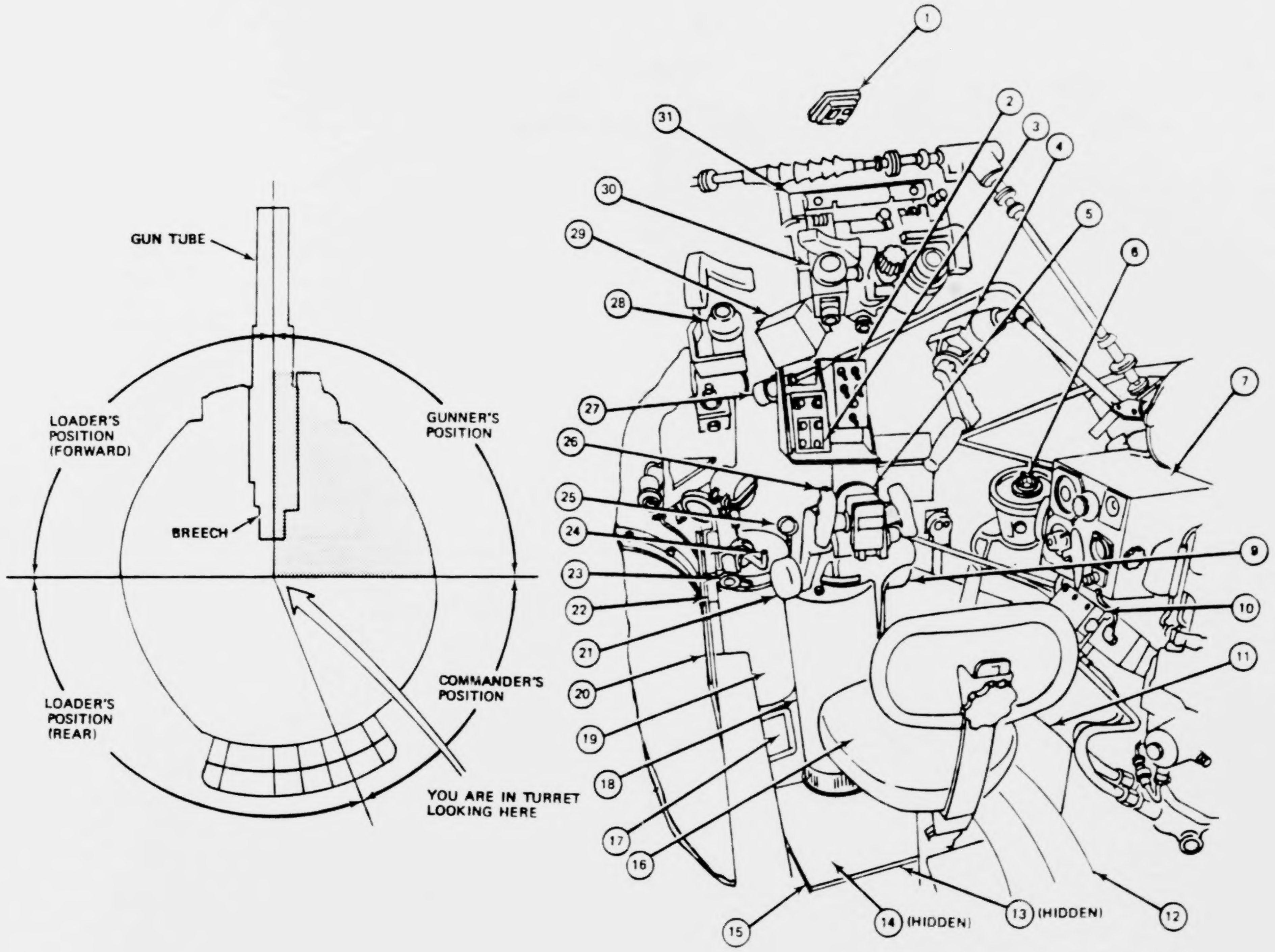
Charts Transposed to

End of Volume.

LEGEND:

1. GUNNER'S DOMELIGHT
2. GUNNER'S CONTROL BOX
3. STABILIZATION CONTROL SELECTOR
4. HAND TRAVERSING DRIVE
5. GUNNER'S CONTROL
6. AZIMUTH INDICATOR
7. BALLISTIC COMPUTER
8. MANUAL TRAVERSING HANDLE
9. TURRET HYDRAULIC SYSTEM FILTER
10. TRAVERSE STABILIZER VALVE
11. GUNNER'S FOOTGUARD
12. 7.62 MM AMMUNITION BOX
13. POWER PACK BLOWER
14. TURRET POWER AND SEARCHLIGHT RELAY BOX
15. GUNNER'S FOOTREST PLATE
16. GUNNER'S SEAT
17. GUNNER'S KNEE GUARD
18. POWER PACK
19. MAIN ACCUMULATOR
20. GUNNER'S GUARD
21. MANUAL ELEVATING HANDLE
22. STABILIZATION RATE SENSOR
23. ELEVATION QUADRANT
24. BLASTING MACHINE
25. PRESSURE GAUGE
26. GUNNER'S CONTROL HANDLES
27. SUPERELEVATION ACTUATOR
28. ARTICULATED TELESCOPE M105D
29. TURRET GUN FIRING RELAY BOX
30. GUNNER'S PERISCOPE
31. GUNNER'S PERISCOPE MOUNT M118


GUN TUBE
BREECH
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
LOADER'S POSITION (REAR)
COMMANDER'S POSITION
YOU ARE IN TURRET LOOKING HERE
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FO-1. EQUIPMENT LOCATION INFORMATION - GUNNER'S POSITION

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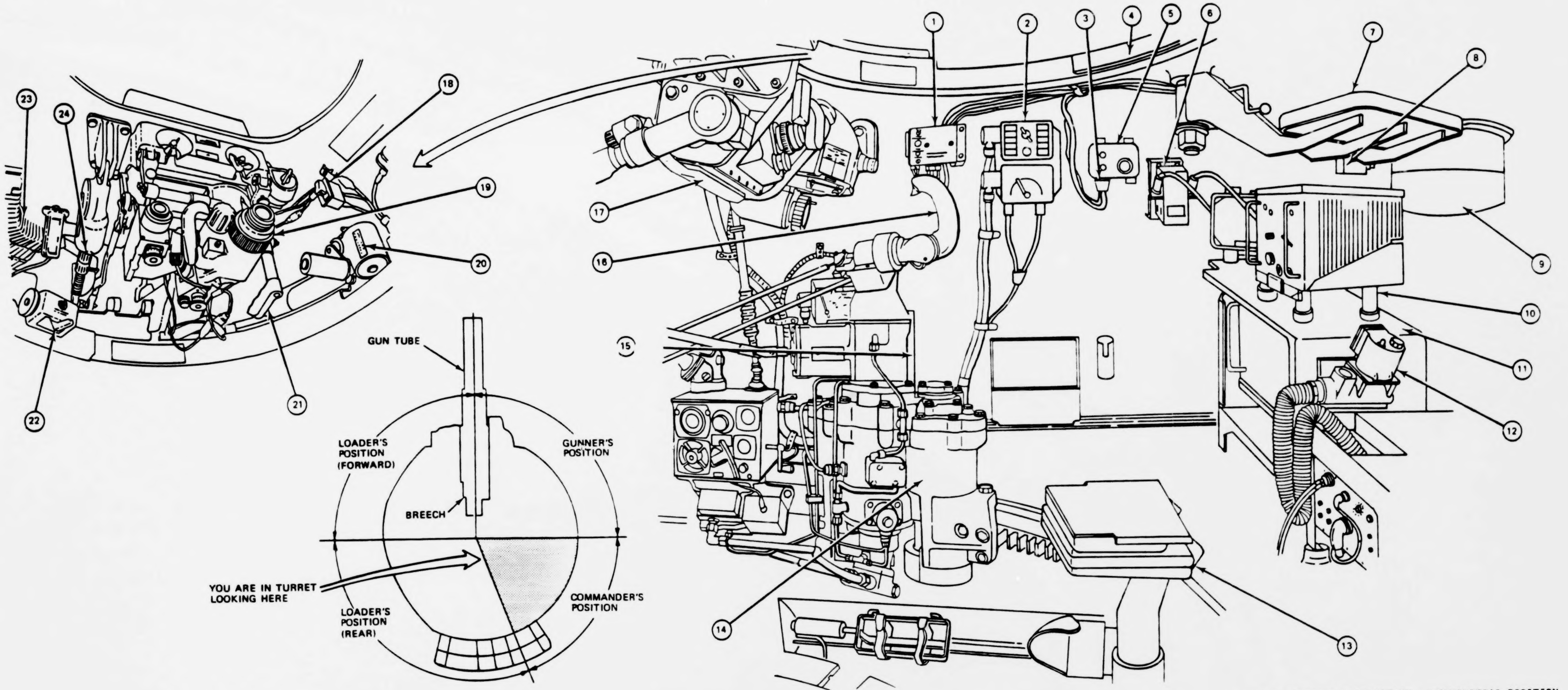
LEGEND:

1. CUPOLA ELECTRICAL POWER CONTROL PANEL
2. COMMANDER'S INTERPHONE CONTROL BOX
3. SEARCHLIGHT DUMMY PLUG
4. BACKREST PAD
5. SEARCHLIGHT CONTROL BOX
6. BATTLE OVERRIDE SWITCH (RADIO)
7. COMMANDER'S SWING SEAT
8. INTERCONNECTING BOX
9. TURRET VENTILATING BLOWER
10. TURRET RADIO SUPPORTS
11. RADIO RACK
12. COMMANDER'S ELECTRIC AIR FILTER HEATER
13. COMMANDER'S SEAT
14. TURRET TRAVERSING MECHANISM
15. ANTI-BACKLASH MECHANISM
16. COMMANDER'S CONTROL HANDLE
17. FIRE CONTROL RANGEFINDER
18. CUPOLA GUN SAFETY SWITCH AND GUARD
19. COMMANDER'S PERISCOPE
20. CUPOLA AZIMUTH GEAR BOX
21. SHIELD OPERATING HANDLE
22. CUPOLA AZIMUTH LOCK
23. FLEXIBLE CHUTE
24. ELEVATION SCREW JACK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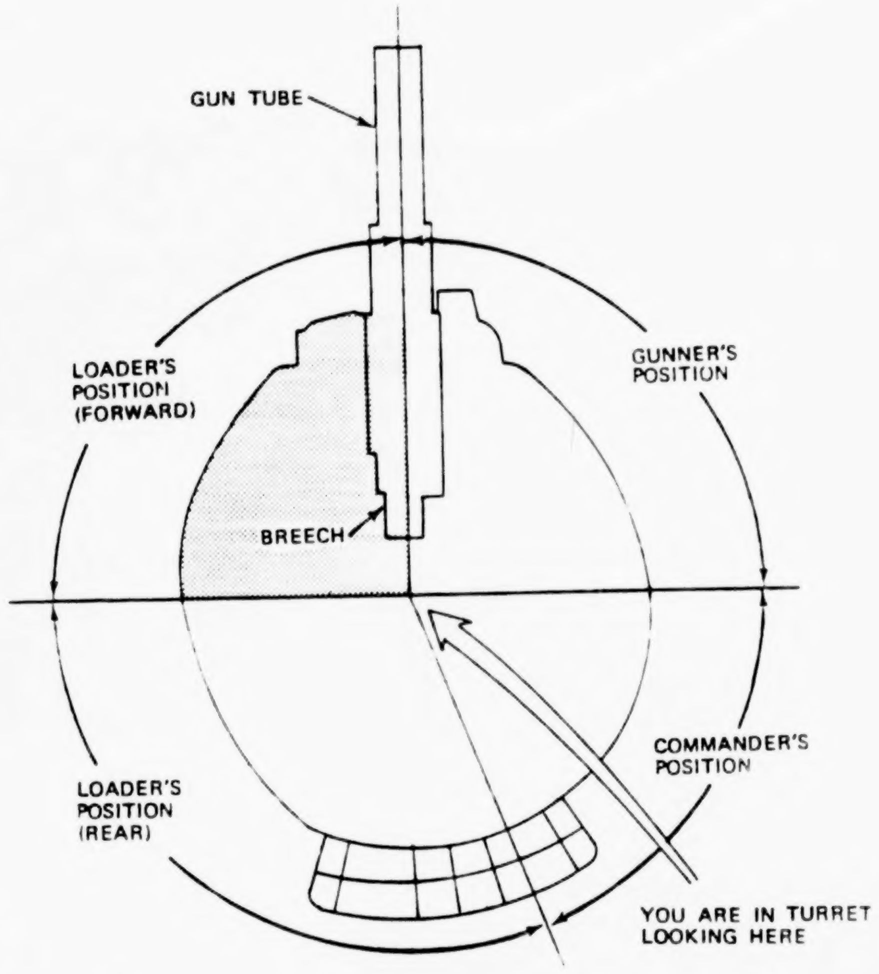
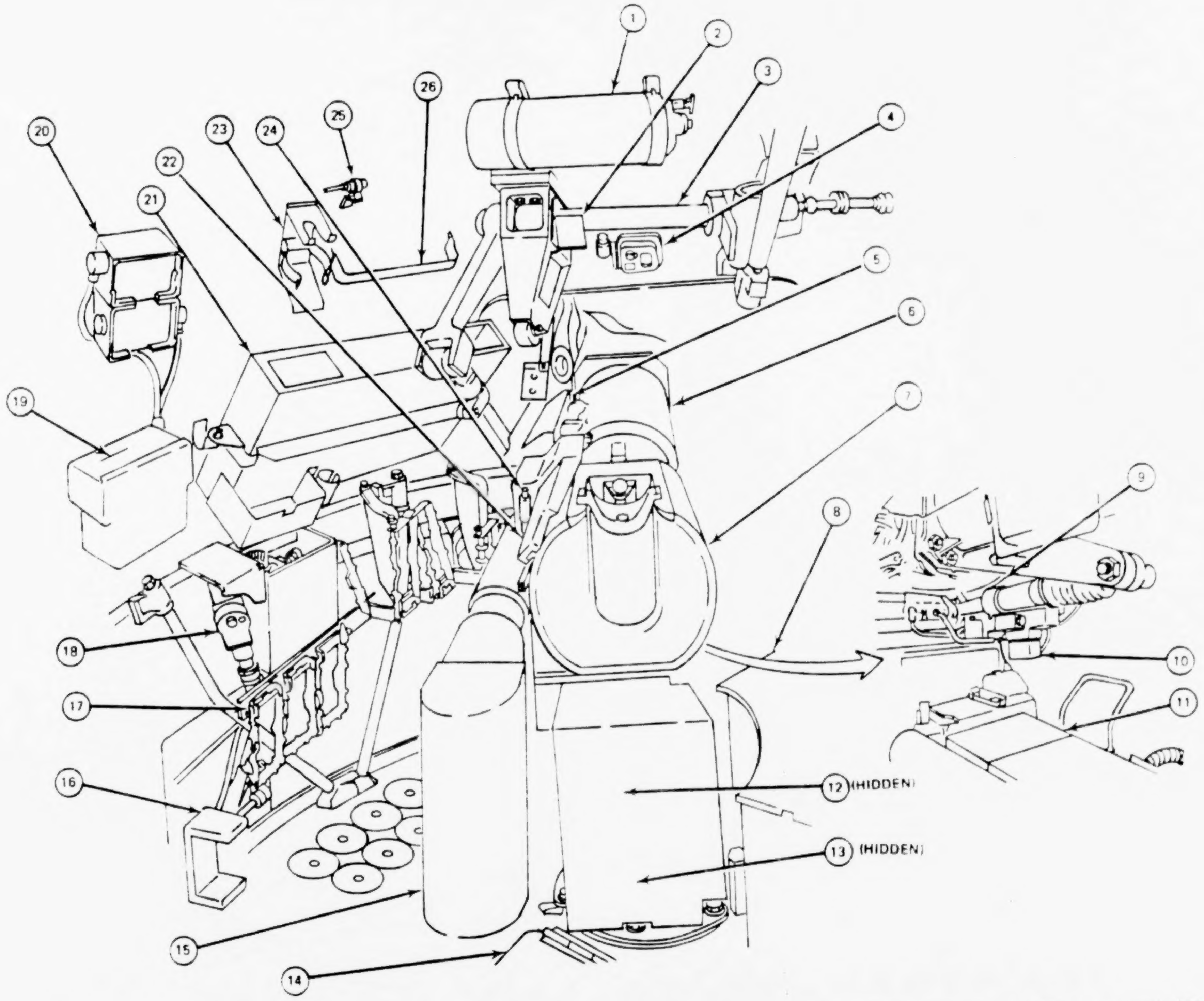
GUN TUBE
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
BREECH
YOU ARE IN TURRET LOOKING HERE
LOADER'S POSITION (REAR)
COMMANDER'S POSITION

FO-2. EQUIPMENT LOCATION INFORMATION - COMMANDER'S POSITION

LEGEND:

1. REPLENISHER
2. GUN ELEVATION INTERFERENCE SWITCH
3. BALLISTIC DRIVE
4. LOADER'S DOMELIGHT
5. MACHINE GUN MOUNT
6. 105–MM GUN
7. BREECH
8. CALIBER .50 AMMUNITION BOXES
9. ELEVATING MECHANISM
10. ELEVATION STABILIZER VALVE
11. PERISCOPE STOWAGE BOX
12. STABILIZATION CONTROLLER UNIT
13. TURRET ELECTRICAL SLIPRING
14. BATTERY ACCESS DOOR
15. 105–MM AMMUNITION THREE ROUND LEFT SIDE RACK
16. FIRE EXTINGUISHER MOUNTING BRACKET
17. 105–MM AMMUNITION RACK RETAINER
18. LOADER'S ELECTRIC AIR FILTER HEATER
19. LOADER'S PERISCOPE BOX
20. LOADER'S INTERPHONE CONTROL BOX
21. 7.62–MM READY ROUND AMMUNITION BOX AND COVER
22. LOADER'S GUARD
23. OILCAN MOUNTING BRACKET
24. LOADER'S SAFETY SWITCH
25. RADIATION DETECTOR
26. CANTEEN MOUNTING BRACKET


GUN TUBE
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
BREECH
COMMANDER'S POSITION
LOADER'S POSITION (REAR)
YOU ARE IN TURRET LOOKING HERE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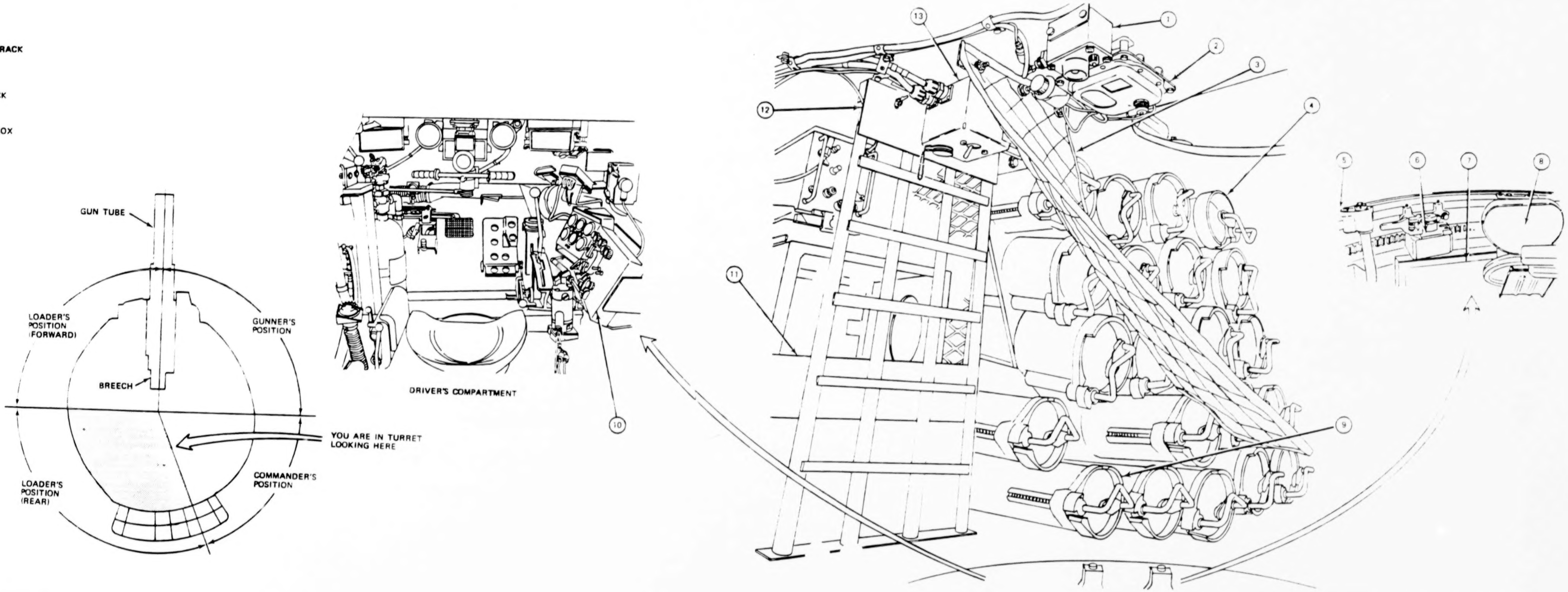
FO-3. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION (FORWARD)

LEGEND:

1. STABILIZATION SHUT–OFF BOX
2. COMMANDER'S DOMELIGHT
3. SHELL EJECTING SHIELD
4. EIGHTEEN ROUND AMMUNITION STOWAGE RACK
5. SHELL RETURN HANGER
6. TURRET TRAVERSE LOCK
7. TURRET PLATFORM GUARD
8. LOADER'S SEAT
9. THREE ROUND AMMUNITION STOWAGE RACK
10. DRIVER'S MASTER CONTROL PANEL
11. ODDMENT TRAY
12. RADIO GUARD
13. TURRET VENTILATING BLOWER CONTROL BOX


GUN TUBE
LOADER'S POSITION (FORWARD)
GUNNER'S POSITION
BREECH
YOU ARE IN TURRET LOOKING HERE
COMMANDER'S POSITION
LOADER'S POSITION (REAR)
DRIVER'S COMPARTMENT
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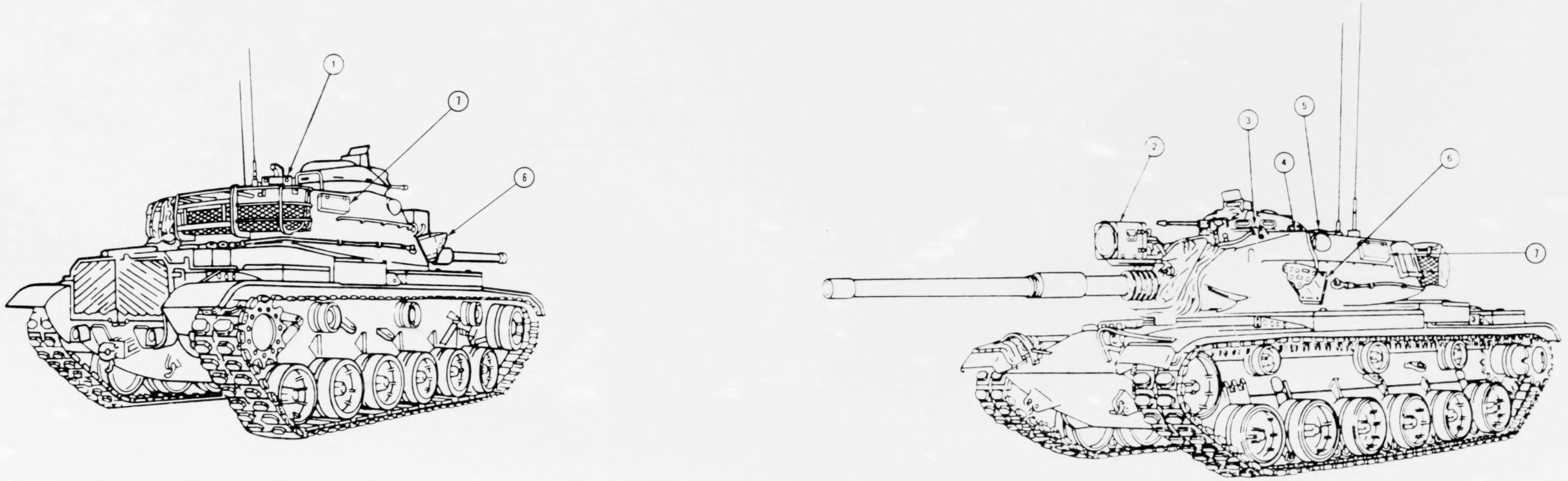
FO-4. EQUIPMENT LOCATION INFORMATION - LOADER'S POSITION (REAR)

LEGEND:

1. SEARCHLIGHT STOWAGE BOX
2. SEARCHLIGHT
3. SEARCHLIGHT CONNECTOR
4. LOADER'S ESCAPE HATCH
5. HOUSING
6. SMOKE GRENADE DISCHARGER
7. STOWAGE BOX



FO-5. EQUIPMENT LOCATION INFORMATION - OUTSIDE TANK